REPORT

OF THE

DEPARTMENT OF THE NAVAL SERVICE

FOR THE

FISCAL YEAR ENDING MARCH 31, 1919

PRINTED BY ORDER OF PARLIAMENT.

OTTAWA
J. DE LABROQUERIE TACHÉ
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1920

[No. 39—1920.]

REPORT

OF THE

DEPARTMENT OF THE NAVAL SERVICE

FOR THE

OCTAVIA

To His Excellency the Duke of Devonshire, K.G., P.C., G.C.M.G., G.C.V.O., etc., etc.,

Governor General and Commander in Chief of the Dominion of Canada.

MAY IT PLEASE YOUR EXCELLENCY:

I have the honour to submit herewith for the information of Your Excellency and the Parliament of Canada, the ninth Annual Report of the Department of the Naval Service, being for the year ended March 31, 1919, except the Fisheries Branch, reported in a separate publication.

I have the honour to be,

Your Excellency's most obedient servant,

C. C. BALLANTYNE,

Minister of the Naval Service.

CONTENTS.

REPORT

OF

DEPARTMENT OF THE NAVAL SERVICE

For the Fiscal Year Ending March 31, 1919.

OTTAWA, August 28, 1919.

Hon. C. C. BALLANTYNE,

Minister of the Naval Service,

Ottawa, Ont.

SIR,—I have the honour to report on the Department of the Naval Service for the year ending March 31, 1919, under the following headings:—

1. Naval Service.
2. Survey of Tides and Currents.
3. Hydrographic Survey.
4. Stores.
5. Canadian Arctic Expedition.
6. Fisheries Protection Service.
7. Life-Saving Service.
8. Radiotelegraphs.
9. Financial Statement.

I. NAVAL SERVICE.

ROYAL NAVAL COLLEGE.

The Royal Naval College of Canada is established for the purpose of imparting a complete education in naval science. The course followed by the cadets covers a period of three years, and includes practical and scientific work in engineering, mathematics, mechanics, physics, seamanship, navigation, English and one other modern language. Although all cadets who have passed through the Naval College since its establishment in January, 1911, have chosen a naval career, this course is not obligatory. While the future of the Royal Canadian Navy is in doubt, the Department of the Naval service does not guarantee that any cadets passing out from the college will have the opportunity of joining the Royal Canadian Navy.

Cadets who elect for a naval career pass out aged from 17 to 19 years as midshipmen. Thus far all graduates of the Naval College have had the opportunity of entering the Royal Canadian Navy. The British Admiralty have consented to admit into the Royal Navy annually eight graduates of the Naval College who have passed with a sufficiently high standard. Cadets joining the Imperial Navy under this arrangement are placed on the same basis as graduates from the Imperial Naval Colleges of Osborne and Dartmouth.

Graduate cadets who do not choose a naval career can scarcely be said to have received an education sufficiently complete to make their own way in the world. Those desiring to continue their studies at one of the universities of Canada are, by concession from the universities of McGill and Toronto, permitted to enter as second-year students in the course of applied science at those universities. They would, in this manner, save one year from their university course.

The Hydrographic Survey of the Department of the Naval Service gives preference to graduates of the Naval College in recommending appointments to their staff. Although the course at the Naval College is not especially adapted for the clerical, medical, or legal professions, for other walks in life where charge of men or material are required, or where ability to take charge, or responsibility is essential, the training given at the college is a fairly certain step toward success.

Entry to the Naval College is made by competitive examinations which are held annually on or about the 15th June. In order to qualify for entry, applicants must have passed their 14th and not attained their 16th birthday on the 1st September of the year in which they wish to enter the college. The examinations are conducted annually by the Civil Service Commission, Ottawa, at central points throughout the Dominion. Applicants for entry to the examinations must make application prior to the 24th May.

At the examinations held in May, 1918, 31 candidates competed, of whom 16 were successful. The successful cadets joined the Naval College at Esquimalt, B.C., the last week in September, 1918; 43 cadets were in attendance at the college during last term. These cadets have been well reported upon, and have given satisfaction to their superior officers; 11 cadets were successful in the passing-out examinations. They were ranked as midshipmen, and were lent to the Imperial Navy for training.

Fifty-one graduates of the Naval College were on active service afloat during the war. Five of these lost their lives while in action. The senior graduates are now lieutenants, R.C.N., of two years' seniority.

Royal Canadian Navy.—As it was not advisable during the war to adequately explain the work being carried out by Canadian Naval forces, opportunity is now taken to review their work during the period of the whole war.

The Active Service of the Canadian Navy has been performed for the most part in Canadian waters or on the high seas adjacent to Canada. The work, however, has been part of the naval policy of the Allies, which should be looked at as part of a unified effort, in many phases of which the Canadian service played an important part.

The work under the department can be divided into three branches: Operation, Naval Intelligence, and Maintenance Transport and Supply—all duties fall within

one or other category. The work of these three branches is closely allied in many phases, and their activities are largely interdependent.

Operations.—Within the operations branch fall the maintenance, manning, and movements of all Canadian ships of war acting on the coasts of Canada, or elsewhere; operations against the enemy, the protection and prevention of enemy attacks on shipping, or on the coast; the prevention of mine-laying; searching for mines and precautions taken to ascertain that all routes frequented by shipping are free from mines and other dangerous obstructions laid by the enemy; the defence or obstruction of particular localities against hostile attack from the sea, etc. The main operations in Canadian waters can be conveniently divided into those on the Pacific coast and those on the Atlantic coast.

Pacific Coast.—At the outbreak of war H.M.C.S. *Rainbow* was stationed at Esquimalt. She had been prepared for sea with a view to undertaking the Behring Sea patrol, but, in view of the threatening aspect of international affairs during the last week in July, had been instructed to prepare for sea in all respects, and hold herself ready to proceed. She was placed at the disposal of the Admiralty, and sailed on the 2nd of August to protect British shipping in the Pacific, and render such assistance as might be necessary to the *two* British sloops of war, the *Algerine* and *Shearwater,* which were stationed in Mexican waters, and which were in great danger owing to the presence there of the two German cruisers, *Leipzig* and *Nurenburg*. The German cruisers, though outranging the British vessels in gun power and speed, did not endeavour to come into action against them. Though the *Rainbow* kept to sea and proceeded southward as far as San Francisco, she was not interfered with, nor could she come into touch with either enemy vessel, though they were in the vicinity at the time. The two small sloops reached Esquimalt in safety without seeing the enemy craft.

The purchase of the two Chilian submarines in Seattle was effected, and delivery obtained in Canadian waters some hours before the declaration of war. They were manned by crews recruited from retired Naval officers and men resident in Canada. They performed patrol duty on the approaches to Victoria and Vancouver, and no doubt had a deterrent effect on the enemy activities off the coast. This small squadron was reinforced in September by the arrival of H.M.S. *Newcastle* from Hong Kong, and still later by the presence of other vessels of the Royal Navy and also of the Imperial Japanese Navy.

The German warships withdrew from the North Pacific waters after having wrecked the cable station at Fanning island, and joined Admiral Von Spee's squadron, coming from Kiao Chiao, and finally met their doom at or shortly after the battle of the Falkland islands in December 1914.

As the *Shearwater* and *Algerine* were of little use for the active operations of war, their crews were both paid off and sent to Halifax for the manning of other larger and more modern ships. The *Shearwater* was then commissioned in the Canadian service as a mother ship to the two submarines, and continued in this capacity until the termination of hostilities. The *Rainbow,* in company with other vessels at different times on the station, continued useful work and operations on the British Columbia,

United States and Mexican coasts, as far south as Panama, keeping close watch on enemy shipping, and making several prizes carrying contraband of war. Her sea service, after steaming over 50,000 miles on this duty, finally terminated in September, 1917, owing to the cessation of enemy effort in these waters subsequent to the entry of the United States into the war in the spring of that year. Her experienced crew, being required for more active service on the Atlantic coast were transferred to Halifax, and she has since been used as a depot ship and for the training on the Pacific coast of officers and men in gunnery and navigation. The submarines and their mother ship the *Shearwater,* were also withdrawn from the Pacific, being no longer necessary there, and proceeded via the Panama canal to Halifax during the summer of 1917, where they joined the other forces engaged in anti-submarine work.

Atlantic.—On the Atlantic coast H.M.C.S. *Niobe* was not in full commission at the outbreak of war, she having been used solely for depot and training purposes for some years. She was immediately placed at the disposal of the Admiralty. No effort was spared to fit her for sea and obtain trained officers and men to complete her complement. Men from the Imperial ships on the Pacific and from the R.N.R. in Newfoundland, with many volunteers and old service ratings from all over Canada, were available, and a full crew with the necessary experience was easily obtained. She was ready for sea in September, 1914, and at once proceeded to take her place on the Atlantic patrol with other cruisers of the Royal Navy of similar classes. She continued in active sea service for one year, and was able to take her full share of that important work during that period, steaming over 30,000 nautical miles on patrol. At the end of that time, however, her boilers and engines required very extensive refitting, and it was decided, in view of her age and the necessity of employing her large crew to the best advantage, to turn her into a depot ship at Halifax. A vessel for this purpose was badly needed in view of the large number of men coming and going and the active recruiting of men being carried on in Canada for the Canadian and Imperial services.

Shortly after the outbreak of war the Russian Government purchased the ice-breaker *Earl Grey* from the Canadian Government, to operate in the White Sea and assist in keeping their vital ports open as long as possible. She was prepared for sea, stored, and manned by a naval crew at Halifax, and proceeded to Archangel, the crew returning to England and Canada later.

Examination services at the main ports in Canada were established for the purpose of preventing any ships of hostile intent entering, and also to facilitate the flow of ordinary commerce. The services at Halifax and Sydney were continued throughout the war, but those at other ports discontinued in 1917, as being no longer necessary.

Atlantic Patrols.—The organization of the necessary patrol and mine-sweeping service has been proceeded with continually since the outbreak of war. Immediate steps were taken to establish swept approaches to Canadian ports as necessary and to maintain patrol ships to guard against possible enemy activities.

The original patrol and mine-sweeping vessels were obtained by converting existing government vessels to those uses, and providing them with trained Naval

crews and defensive armament, and by the charter or purchase of other suitable craft. Patriotic owners also placed several suitable vesels at the disposal of the Government, for use as patrol vessels, free of charge.

Naval Construction in Canada.—As the danger from enemy submarine activities increased, steps were taken to augment the number of the mine-sweeping and patrol flotillas by specially built vessels of the trawler and drifter type which have been largely used in European waters for similar duties.

Early in 1917 the department placed orders for twelve (12) patrol vessels, and shortly afterwards, upon the request of the Imperial Government, entered into contracts for the construction in Canada of sixty (60) trawlers and one hundred (100) drifters for use wherever necessary. This large construction programme necessitated a further extension of the work of the department, and it was decided to form a Ship-construction Branch with headquarters in Montreal to undertake these fresh responsibilities. The department was fortunate in obtaining the services of one of the leading business men in that city, Mr. J. W. Norcross, who gave his services free of charge, as director. A technical and directing staff was quickly gathered, and contracts let for the construction of the vessels in the following localities:—

Montreal	11 trawlers	30 drifters
Sorel	6 "	20 "
Lévis	6 "	50 "
Three Rivers	3 "	
Kingston	6 "	
Collingwood	8 "	
Toronto	6 "	
Port Arthur	14 "	

Contracts for the engines, boilers, and auxiliary machinery were made with reliable firms throughout the country, and the whole work proceeded with, with the least possible delay, so that the vessels might be available for service during the summer of 1918. Many of the ships were available in 1917, and a few of the drifters were sent to European waters in the fall of that year, under Canadian crews. The remainder and all the trawlers available were employed during the past year off the Atlantic coast in anti-submarine work.

List of ships engaged.—At the close of hostilities the vessels under the department were as follows:—

On the Pacific.—H.M.C.S. *Rainbow,* depot and training cruiser; H.M.S. *Algerine,* sloop; auxiliary patrol vessels *Malaspina* and *Galiano,* and several motor launches for harbour defence work.

The *Galiano* was lost with all hands some days prior to the signing of the armistice, whilst engaged on important duties off the British Columbia coast.

On the Atlantic—based on Halifax and Sydney.—H.M.C.S. *Niobe,* depot and training ship; submarine depot ship H.M.C.S. *Shearwater* and 2 submarines, T.B. destroyer H.M.C.S. *Grilse,* 9 auxiliary patrol vessels, 47 armed trawlers, 58 armed drifters, 11 armed minesweepers and tugs, and a large flotilla of motor launches for coastal patrol and harbour duties.

Naval Depot, Sydney.—The maintenance of flotillas in the gulf of St. Lawrence, Belle Isle, and Newfoundland waters necessitated the establishment of a large depot at Sydney to afford a more convenient base for vessels operating in these waters. Convoys of slow ships proceeding from North America were assembled here before finally sailing for Europe. Sydney harbour, therefore, became an important naval port, and the depot there was of vital importance and the headquarters of great naval and commercial activity during the open season of navigation.

Areas patrolled.—The length and nature of coast to be patrolled and the quantity of valuable shipping frequenting these waters made these operations of great importance and considerable difficulty. The area covered by the patrol service of the department reached from the straits of Belle Isle to the Bay of Fundy, and from Quebec to the east of the Virgin Rocks. Within that area the patrol service was responsible for carrying out all patrols, convoys, minesweeping, protection of the fishing fleets, and other duties arising. That so few submarines have ventured into these waters, and the inconsiderable loss of shipping due to enemy activity (only one large vessel was lost by enemy attack), is a tribute to the value of the Canadian measures of naval defence adopted.

Port defence.—Anti-submarine nets were stretched across the entrances to Halifax and Sydney harbours early in the war, and were maintained throughout hostilities as a further necessary protection to the valuable naval and commercial vessels frequenting these parts.

Recruiting.—The manning of these numerous flotillas received early attention from the department, and recruiting was actively carried on throughout the country, a total of 10,000 men being entered for our different services. At the termination of hostilities the personnel of the service was as follows:—

Officers	700
Men	4,768

In addition to manning the service in Canada, the department has enrolled over 1,700 men for service with the Imperial fleets overseas. Many British naval reservists resident in Canada also rejoined the service for the period of the war, and further enrolments were made on behalf of the Admiralty of 580 probationary flight lieutenants for the Royal Naval Air Service prior to the institution of the direct recruiting effort for the Air Services of the Imperial Government through the Royal Air Force in Canada. In addition, 73 surgeon probationers from Canadian medical schools have been sent overseas for the Royal Navy, and a number of the officers of the Hydrographic Survey volunteered for duty under the Hydrographic Service of the Admiralty. They were granted commissions in the Royal Naval Volunteer Reserve, and engaged on important surveying duties in European waters in connection with the laying of vast mine fields and other important work of a similar nature.

More than 500 Canadians hold commissions in the Royal Naval Volunteer Reserve, and are employed in the British Auxiliary Patrol and other services, and large numbers of officers and men also enlisted in the Inland Water Transport Service organized by the Royal Engineers for work in Europe, Mesopotamia, and elsewhere, as required.

Radio-telegraph service.—The Canadian Radiotelegraph Service has been very active during the war, and the services rendered by this organization have been of great value. This service controls about 200 stations ashore and afloat. The chains of stations of either coast have been taken over as Naval Stations, and the Atlantic Coast chain extended and strengthened by the erection of one large new Naval Station at Barrington, N.S., to form an uninterrupted chain of naval communications from St. John's, Nfld., to Demarara. Four direction-finding stations have been erected during the war on the Atlantic coast. Two stations have been acquired for improved communication. Representatives of the department were also stationed at the large transatlantic station just completed on the outbreak of war at Newcastle, N.B. This plant has been used for interception work, and much valuable intelligence work has been done through the results obtained.

The equipment of naval ships and stores transports with wireless sets has been undertaken on a large scale by this branch of the department. The supply of trained operators made considerable demands on the supply of skilled men available, so much so that the department found it necessary to open a training school for operators to enable the demands to be met. About two hundred young men were passed through this course, and are now in service all over the world in different ships as warrant officers. A detailed report on the Radiotelegraph Branch is given at page 46.

Naval Intelligence Branch.—The Naval Intelligence Branch is charged with the collection and distribution of information with special reference to naval and marine questions. This work has been performed throughout in closest touch and co-operation with the Imperial Government, through the Admiralty and its officers abroad. In addition to the collection of information as to the plans of operations by the enemy's naval force, it includes the movement of all shipping, naval and commercial, in Canadian and adjacent waters; all questions relating to the enemy and neutral commerce; questions relating to contraband of war and censorship of radiotelegraph, etc. Many of these questions call for close co-operation with other government departments. Such work has been carried out in conjunction with the Departments of Militia, Marine, Trade and Commerce, Post Office, Secretary of State for External Affairs, and other departments as necessary.

At the outbreak of the war only a skeleton organization existed for this purpose. The war necessities in this respect had not been overlooked, however, and plans had been made in advance covering such an organization and its requirements, and steps were taken as necessary to provide the facilities and staff.

Neutral commerce.—During the neutrality of the United States the closest watch was necessary on enemy activities in connection with trade and contraband of war; the movements of vessels engaged in this trade; and radio-telegraph communications passing between Germany and the United States. The whole trade of the North American continent with neutral countries was conducted under the supervision of the Admiralty. All ships engaged in this trade were subject to examination and approval of their cargoes and papers en route. The examination was carried out at first in European waters, all vessels being collected at suitable points and held pending exam-

ination. Owing to the growth of submarine warfare and the inconvenience caused to traffic by these measures, it was later decided to institute an examination service for neutral shipping at Halifax, so that the work could be conducted with greater safety and convenience prior to the departure of these vessels from American waters. Halifax, with its magnificent harbour and anchorages in Bedford basin, was chosen as the most suitable port for this purpose, and hundreds of vessels proceeded there, and there obtained the necessary permits to enable them to sail for European destinations. These duties alone called for a large staff of qualified officers and a large intelligence system to provide for expeditious handling. Bedford basin was for many months one of the greatest commercial anchorages in the world—as many as ninety ocean-going ships having been anchored there at one time.

Much information of great value was collected and transmitted to the Admiralty on enemy activities. The full history of the British effort in this direction, and the wide ramifications of the plans which had to be worked out, have not yet been disclosed, but it may be stated now that the department had no small share in this work, and rendered valuable assistance along these lines in the North American continent. The entry of the United States into the war as an associated power brought many of these activities to a speedy end. Responsibility for action in regard to others was taken over by the agents of that Government.

Convoy System.—While the duties of the department in these respects have decreased considerably since the first two years of the war, the increase in other directions has been immense. The control of the movement of all shipping has gradually been taken over by all Allied Powers from private parties and placed under government supervision. The movement from North American ports has greatly increased, and the institution of the convoy system, and regulation and routing of transatlantic traffic has called for a large organization previously non-existent.

The system whereby ships were collected at American ports to proceed to Europe under the escort of cruisers was forced upon the Allied Governments by the great loss of tonnage through the difficulty of patrolling and protecting single ships proceeding to many different destinations. Halifax and Sydney, being the ports on the American continent nearest to Europe, were the natural starting points of such convoys, and for all ships from Canadian and Northern United States ports convoys assembled at Halifax during the winter months, and at both ports during the summer months. The organization of these convoys, the timing of their arrival and departure, the mustering of the ships and the giving of detailed instructions to their officers required most careful study in order that they might proceed on regular schedules with as little delay as possible. Ships were divided into three classes, fast, intermediate, and slow, and convoys arranged as necessary, according to the number of ships sailing from the different points of departure.

The growth of enemy submarine effort on the Atlantic coasts of America further increased the duties of this branch. Much work in connection with the movement of the great number of ships required to transport the Canadian and United States forces to and from Europe has also been necessary and has further added to the responsibilities of this important branch of the service. The issue of war warn-

ings to all shipping; the routing of the convoys; and the co-operation of the efforts of the Canadian, Imperial, and United States Governments has required an immense amount of steady, continuous effort of which the general public has seen little.

Canadian Atlantic coast patrol.—The work of protecting convoys and the general coast defence operations was carried out by a special Patrol Service under the Captain of Patrols; the patrol squadron consisted of:—

10 Auxiliary patrol vessels.
12 Canadian trawlers (named).
7 Trawler sweepers (type known as P.V.'s, and numbered).
36 Trawlers (known as T.R.'s, and numbered).
36 Drifters (known as C.D.'s, and numbered).
15 Drifters (Imperial and temporarily lent, known as I.D.'s, and numbered).
6 United States submarine chasers.
1 United States torpedo boat (allocated to Air Service, Halifax).

All the above vessels were manned by Canadian Naval ranks and ratings (with the exception of the United States vessels). The total number of ranks and ratings employed was approximately two thousand.

The area patrolled, and over which practical operations were continually carried out, extended from Belle Isle to Shelburne and from Point des Monts (St. Lawrence) to the Virgin rocks, including the Nova Scotia Banks and Grand Banks. This area consisted of some 1,800 miles of coast line, besides open-sea area routes which had to be patrolled.

The operations on which the vessels of the patrol squadron were employed were:—

Coast patrolling and investigation at all points of the coast line of reports of suspicious craft sighted, suspicious lights, possible mines, etc.

Constant patrol of certain positions of strategic importance.

Frequent patrols of the Grand Banks and Nova Scotia Banks, and giving warning to fishing vessels of enemy submarine activities.

Port patrols off Halifax and Sydney.

Daily minesweeping of the approaches to Halifax, Sydney, and St. John's, Nfld.

Frequent exploratory sweeps over mineable waters along the coast routes of shipping.

Convoy escorts to the slow convoys transporting stores overseas for some 150 to 200 miles out to sea. (These convoys numbered from 25 to 43 vessels in a convoy.)

Convoy escorts to the troop convoys leaving Canada.

Convoy escorts continually along Canadian and Newfoundland coastal routes.

Organized searches over areas where and when enemy submarines were known or believed to be operating. In addition to the above work a very considerable amount of salvage work has been done by the Canadian patrol vessels.

The force was divided between the bases of Halifax and Sydney in proportion to the measure of activities required in the neighbourhood of these ports, and the force based on each of these ports was further divided into separate flotillas utilized respectively for patrols, convoy escorts, minesweeping, etc.

The main principle guiding the amount of sea time for patrol, convoy escort, and other flotillas engaged in work beyond the minesweeping of harbour approaches was that two-thirds of the force were actually in active employment, one-third being

in harbour undergoing necessary overhaul, coaling, storing, etc., and their personnel receiving instruction in gunnery, minesweeping, signals, hydrophones, depth charges, etc.

By this it is seen that the force was maintained actually at sea for two-thirds of its time, which, when the weather conditions off the coast, the class of vessels employed, the small number of their crews, and consequent strain are considered, together with the amount of work which had to be carried out even when in harbour, is considered as much as could be expected of the crews.

Troop Transportation.—The work of transportation falls naturally into two categories; men and matériel. In regard to the former, the department has co-operated with the Imperial Government and the Department of Militia and Defence in the transportation of all troops sailing from Canadian ports. The Naval Transport officers at the ports of embarkation are responsible for the inspection of all troopships and their accommodation, life-saving equipment, etc., and co-operate with the military embarkation officer in the embarkation and landing of the troops. The control of the movement of all these vessels in Canadian waters rests with the department, who arranged for convoy escort, and other precautions for the safety and despatch of the ships, with the Admiralty. Of the many hundred thousand troops passing overseas from Canada during the last four years not one man has lost his life through marine accident. No further comment is necessary on the efficiency of the arrangements made.

Store Transport Service.—The transportation of matériel and the necessity for the provision of an efficient ocean transport service so that food supplies and munitions of war produced in Canada might be promptly exported to European ports has received the constant attention of the Government since the outbreak of war. Early in August, at the instance of the Prime Minister the services of an officer, expert in ocean and railway transportation matters, were obtained from the Canadian Pacific Railway Company to take charge of this work, with the title of the Director of Overseas Transport.

The Department of the Naval Service, as agent for the Admiralty, had charge of the provision of cargoes for the many colliers returning empty from the fleet in our North Atlantic waters. In December, 1914, these two activities were co-ordinated under the Naval Service, as it was realized by the Government that great efficiency and economy would be secured by joint operation. The Admiralty placed a number of requisitioned ships on the service so as to ensure regular sailing and adequate tonnage. The use of returned empty colliers was continued, though owing to the number of cruisers being reduced, the space available from this source was not large.

It was arranged that the Department of the Naval Service should control the movement of the ships, and furnish reports to the Admiralty on all phases of the work. All expenses in connection with the work were defrayed by this department on behalf of the Imperial Government, on presentation of duly certified invoices. The Director of Overseas Transport was given control of the traffic inland, by rail or otherwise, its reception and storage at ports of shipment, all allocation of the cargo to the different ships and stowage on board of the various materials so as to ensure the maximum use of the tonnage placed at our disposal by the Admiralty.

Transportation matters have been the subject of discussion between the Prime Minister and other Ministers who have visited England during the war, and the Imperial Government, with a view to closer co-operation and the utmost efficiency in the conduct of this vital service.

The Minister of the Naval Service visited London during the summer of 1918, and his negotiations on transportation matters with the authorities there resulted in a decision to form a branch of the British Admiralty of Shipping in Canada under the direction of the Director of Overseas Transport, as Director General, working in conjunction with the Department of the Naval Service as regards the movements of ships and other matters, but under the direct financial control and operation of the British Ministry of Shipping. These proposals were concurred in by the Canadian Government, and became operative in July, 1918.

Every effort has been made by the Government to maintain and reserve for Canadian railways and ports the shipment of the full produce of the Dominion, and, in addition, to endeavour to secure the routing through Canadian channels of as large a proportion of the freight originating in the United States as could be economically shipped from Canadian ports. The measures taken to achieve this end have been successful, and a large proportion of the freight originating in the northern, central, and western states has been routed through Montreal during the summer season of navigation.

Early in 1917 the growth of the tonnage to be shipped and the further extension of government activities to commodities hitherto handled by private effort had made the provision of further cargo space imperative. The policy of requisitioning space on all liners sailing from Canadian ports was adopted as the most convenient and efficient method of meeting the new situation. At first eighty-five per cent (85%) of the cargo space on all liners was taken over by the Government at fixed rates. The remainder was placed at the disposal of the shipping companies for the accommodation of private shipments of foodstuffs or other necessary war supplies only. This arrangement was later modified by the force of circumstances, after which all the space available was at the disposal of the Government. Arrangements were made for the provision of space for approved shipments on account of private firms so that undue hardships might not result from the requisitioning of all available ocean space.

In practice the inconvenience has been much less than anticipated, as government supervision of trade has been extended to cover practically every branch of Canadian activities, whether foodstuffs, raw materials, timber, or manufactured goods.

This service from a small beginning has grown to a very large undertaking. The average monthly export was as follows:—

1915	50,000 tons
1916	170,000 "
1917	331,000 "
1918	387,000 "

to December 1, or a total from January 1, 1915, to December 1, 1918, of over eleven and one-quarter million tons of freight. The growth in tonnage was practically continuous, the largest months being October and November, 1918. During these two months, 1,300,000 tons were exported, about 1,000,000 tons being shipped

from Montreal alone. This traffic originates in all parts of Canada and the northern and western states, and the work of organizing its transportation to the ports of shipment is very great. The services rendered by the Director of Overseas Transport and his staff in this connection cannot be overestimated. The organization has worked with the greatest regularity and despatch. Practically no delays have been experienced throughout. The movement has been rendered possible only by the ready co-operation of all transportation companies with the staff of the service in all matters.

In view of the importance of utilizing to the utmost every ton of shipping on the service, no efforts have been spared to give each ship the promptest despatch possible.

The supply of fuel oil for the fleets in European waters has been a great anxiety to the authorities. In July, 1917, steps were taken to utilize the double bottoms of ordinary merchant vessels for the carriage of oil. During the first six months of operations no less quantity than 167,055 tons were shipped from Canadian ports, practically all by this method. This represents a very considerable saving of tonnage in view of the general shortage of tank steamers.

The timber shipments handled by the service were exceptionally heavy during 1916. The amount of timber exported was over 300,000,000 feet, and the rate of loading averaged for eighty ships 183 standards per weather-working day. During the last two years, owing to the scarcity of shipping and the extension of the work of the Forestry Services in Europe, these shipments have been confined almost entirely to small parcels forwarded on store transport, and to shipments of silver fir and spruce for airplane manufactures.

The various railways and the shipping interests have throughout co-operated in the fullest manner with the department and the Overseas Transport staff, and have placed their facilities at the disposal of the service in a most generous way. A very great debt of gratitude is owing to all for their continued assistance and ready co-operation in handling this vast undertaking. It is not too much to say that their efforts have enabled Canada to provide the most efficient transport service now in existence. It is to the work of this organization in providing a prompt and efficient transport service that the magnitude of the orders which have been placed for the products of the forests, fields, and factories of Canada by the Imperial and Allied Governments is largely due.

Refitting and repair work.—Supply and repair work has largely been centred in the Canadian dockyards on either coast—Esquimalt on the Pacific and Halifax on the Atlantic. Prior to the war the dockyards had been maintained by the Canadian Government in the condition in which they had been originally taken over from the Imperial authorities. Owing to their strategic positions they become centres of great naval activity. The various machine shops and repair facilities have been in continual use throughout the war and extended by the purchase of modern equipment so that further work could be undertaken.

At Esquimalt, in particular, refits of many Imperial ships have been undertaken, involving large operations. H.M.S. *Kent,* after the battle of the Falkland Islands, proceeded there to repair the damage sustained, and the salvage operations

of the Japanese battleship *Asama*, stranded off the lower Californian coast, were based there, and, on their successful accomplishment, the ship was towed to Esquimalt to refit for her return to Japan. Continual use has been made of the facilities afforded to ships in Pacific waters for refitting, repair, coaling, and replenishment of supplies.

The large number of Canadian naval craft based on Halifax throughout the war occupied the ship-repair facilities of the department to the fullest extent. Much new and modern machinery was installed to enable the constantly growing work to be dealt with efficiently. In addition to the department's own ships, Imperial and Allied ships made constant demands on the workshop capacity of the dockyard. The steady growth of this work necessitated recourse to outside establishments for the execution of many contracts, and much work of this nature has been undertaken by commercial firms. Several large cruisers were refitted in the large docks at Halifax and Montreal under the supervision of the department's engineers.

Armament of merchant shipping.—The defensive armament of merchant shipping on a large scale has been undertaken both for Canadian and Imperial ships. A special staff of qualified officers and men was continually engaged at Halifax, Montreal, and St. John in this work, and contracts for the performance of the necessary structural alterations were entered into with qualified firms as necessary. The fitting of transports for troops, horses, and special cargo was also undertaken under the jurisdiction of the department. Such work included the loading and securing on ships' decks of about 600 launches, tugs, and scows of large sizes and weight, involving special arrangements for lifting and stowing. The successful transport in all weathers of about 600 of such craft across the Atlantic without loss through marine accident is in itself probably a record in this line.

The disaster at Halifax on December 6, 1917, caused much destruction in the dockyard. Immediate steps were taken to repair and replace the damaged structures and machinery so that the essential work for the various services could be continued. Temporary arrangements have been completed, and a new scheme drawn up for the provision of the facilities required at a modern dockyard.

Supply work.—The supply services of the department have been important and wide reaching. Not only do they provide for the requirements of the ships of the Royal Canadian Navy, but for all Imperial and Allied ships requiring supplies in these waters as well. In addition, the requirements of H.M. dockyards at Bermuda and Hong Kong, and ships based on them, have been taken care of in many respects, particularly as regards provisions, and, in a lesser degree, clothing and naval stores. No effort has been spared to assist all services in this respect.

Contracts have been arranged for fresh provisions for the convenience of all ships of war, and large stocks of sugar, flour, canned meats, and other non-perishable goods are maintained for issue as required. In addition, very large supplies of victualling stores have been shipped from Halifax dockyard for the provisioning of the fleets in European waters during the past twelve months. Provision is also made for the ready supply of all clothing, medical, naval, ordnance, and torpedo stores, as required, prin-

cipally to Canadian ships and establishments, but also to Imperial and Allied vessels in need of them. Large reserves of coal are held at the Canadian dockyards for all ships of war, and the coaling work on both coasts has been very heavy. In addition to the supplies of special steam coal for warships, contracts have been entered into with Canadian colliery owners for the use of their coaling facilities by vessels requiring them.

The growth of the supply operations is shown by the following figures of the expenditures of the Stores Branch of the Department:—

1916	$ 2,500,000
1917	7,500,000
1918	10,000,000

A detailed report of activities of the Stores Branch is given at page 31.

Ship construction for Allied Powers.—The naval construction work undertaken in Canada, apart from the mercantile shipbuilding programme of the Imperial Munitions Board and the Department of Marine, and naval vessels for this department, has been considerable. The following craft, all for naval war purposes, have been built in Canadian yards during the war:—

For the Imperial Government	12 Submarines, 60 Armed trawlers, 100 Armed drifters, 550 Coastal motor patrol boats, 24 Steel lighters, for use in Mesopotamia, and shipped there in sections.
For the French Government	6 Armed trawlers, 36 Coastal motor patrol boats.
For the Italian Government	6 Submarines.
For the Russian Government	1 large armed icebreaker, and some submarines.

In addition to this new construction, a large number of seagoing tugs and other vessels have been purchased by the Imperial and Allied Governments, and have been sent overseas to aid in the naval effort in European waters. Such vessels were fitted for the transatlantic passage by the department at Halifax dockyard.

The Royal Canadian Naval Air Service.—The necessity for the formation of a Canadian Air Force was given consideration in the early stages of the Great War, but it was deemed advisable to concentrate Canada's full effort on the establishment of a strong expeditionary force, as the seat of hostilities was, at that time, in Europe, and it did not appear likely that Canada would be subject to actual attacks from the enemy.

With the advent of German super-submarines in the High Seas, and the extension of submarine warfare in 1918, it became apparent that commerce to and from Canadian ports would be subject to ever-increasing danger.

In March, 1918, the Admiralty advised the Canadian Government of the conditions which might result from the extension of submarine warfare, and suggested that Canada should form an Air Force.

At the same time the Admiralty expressed their regret that very little assistance could be expected from the Imperial Government, as all the available aircraft and personnel were required in home waters, in the Mediterranean, and the Western Front.

The Canadian authorities acquiesced in the suggestions of the Admiralty, and placed the actual formation of a Canadian Air Force, which was to be known as the Royal Canadian Naval Air Service under the jurisdiction of the Naval Department.

Expert engineers were obtained who chose suitable bases at Dartmouth and Sydney, and the construction of the buildings required was placed in the hands of the Public Works Department, who acquired the necessary land and expedited construction work. The plans and specifications were furnished by the British Admiralty and the United States Government.

As the United States were sending large numbers of their troops overseas through Canadian ports they were desirous of having aerial patrol protection for the troopships. The Canadian and United States Governments combined efforts to put the Canadian air bases into commission until such time as Canadians could be trained to carry out the air patrols. The following equipment was put in operation at Halifax under this arrangement:—

(1) Four H.S. 2 flying boats complete with all necessary spares. These equalling 50 per cent of the original.

(2) Two kite balloons, complete, with necessary additional spares, winches for same, and hydrogen plant.

(3) Steel portable hangars for housing flying boats.

(4) Complete U.S.A. personnel for manning the above according to U.S.A. establishment.

The authorities made similar arrangements for North Sydney, as it was contemplated that the submarines would choose the St. Lawrence route for operation in September and October.

By September 5, 1918, the general outlines of regulations governing the Royal Canadian Naval Air Service were drawn up and approved by the Canadian Government.

The organization at that time was of temporary nature to meet the needs of the war. Its discipline was the same as that maintained in the Royal Canadian Navy. It also provided for the immediate establishment of operations and for the training of personnel and equipment of the stations with Canadian machines.

The pay of men entered for this service was also defined.

As early as 16th August, 1918, the first American Personnel, together with two flying boats, arrived at Halifax.

Although the Public Works Department had hastened the construction work for the station there, as much as possible, the work was not completed. The personnel were, however, put under canvas, the machines were assembled and on August 25, 1918, the first convoy patrol was carried out. Patrol flights and convoy flights were established and carried out from both stations, until the signing of the armistice.

Up to the time of the armistice, 82 cadets had been recruited; 60 were under training in the United States, 13 were in England training for service in the "Lighter-than-Air" section, and 8 were awaiting instructions as to when to report for training.

In addition to these, 6 coxswains were enlisted and sent to England as airship coxswains.

The feeling between the United States and Canadian authorities throughout was most friendly, and the department wishes to express its appreciation for the valuable co-operation of the United States Government.

By the time of the signing of the armistice, a complete organization had been established capable of recruiting and training personnel and taking care of equipment. A "medical section" and "pay section" had also been organized, and were in smooth working order.

Scales of pay and allowances for officers and men in this service were also drawn up and approved.

Immediately after the signing of the armistice, the Department of Public Works was instructed to stop the construction of buildings at Dartmouth and North Sydney. Sleeping and recreation buildings had, by that time, been completed at both Halifax and Sydney; store buildings had also been completed, and temporary hangars, without floors, were partially finished.

The authorities decided in December that the recruiting of personnel for the Royal Canadian Naval Air Service and the training of cadets and men should not be proceeded with, and that cadets already enlisted should be demobilized and returned to their homes.

Demobilization commenced immediately, and only a few officers and men were retained to wind up the office affairs of the branch at headquarters and maintain the equipment of the two stations in good order. The American officers and men in the service were also returned to the United States.

The Department of the Naval Service retained all the ground material required at equitable prices. All flying material, including 14 H.S. 2 flying-boats and 25 Liberty motors, were presented by the United States to Canada; these, together with any stores at the two stations, were placed under the care of a small maintenance party.

Expenditures.—The total expenditures for construction at the two air bases were as follows:—

Dartmouth	$335,798 94
Sydney	238,643 45

A large part of the above amounts was expended by the Department of Public Works, who had charge of building the stations.

The departmental expenditure in operating the stations is as follows:—

Pay and allowances	$ 24,400 50
Stores, clothing, etc	75,046 51
Medical services	580 25
Recruiting expenses	897 79
Repairs, hire of vessels, etc	12,075 55
New works, lands, buildings (expenses defrayed by Naval Department)	28,607 64
Travelling expenses, telegrams, advertising, etc	28,527 92
	$170,136 16

General.—This completes this brief review of Canada's naval activities during the war. Most of the work has from its nature been performed in secrecy, and its full extent will not be known until the complete history of the war is written.

At the outbreak of war the department's naval organization consisted of one sea-going cruiser on the Pacific coast and one on the Atlantic. The staff of experienced naval officers was small, and the volume of work has necessitated a tremendous growth of staff, both naval and civil. Owing to the urgent call for the services of every experienced man available for work in European waters, little assistance could be obtained from the Admiralty, and, with one or two notable exceptions, the increased work has been met by the efforts of the original staff, supplemented by the assistance of a few retired naval officers and many recruits from the mercantile and R.N.R. officers available in Canada. Many most important duties have been undertaken by men from civil life without previous experience in naval administration. The amount and quality of work accomplished by the organization so gathered together is a remarkable example of what can be done by industry and organization, and a tribute to the resource and initiative of those officers on whom was thrust the performance of such responsible and onerous duties.

2. TIDAL AND CURRENT SURVEY.

The work of this branch of the service consists in the prediction of tides and the scientific investigation of the currents of Canadian navigable waters. The object of the work is primarily to assist in the navigation of waters where the irregularity of tides and currents renders navigation difficult.

During the past year considerable progress has been made with tidal information for both coasts of Canada, and also in the investigation of currents in the passes of the Pacific coast.

The principal tidal stations have been maintained in continuous operation throughout the year, with the exception of some interruptions from storms which have been unusually severe. The record from these stations which has been reduced and submitted to analysis during this year was from the Pacific Coast stations. There were eight years of such record in all from the tidal stations at Victoria, Vancouver, Clayoquot, Point Atkinson, Prince Rupert, and Port Simpson. The tidal station at Port Atkinson has been found to be practically identical with Sand Heads, and the data obtained there will thus improve the tide tables for the strait of Georgia generally. The reduction of this record at the other stations named will improve the tide tables for the important harbours of the coast, and also for tidal stations which are used as ports of reference for the turn of the strong currents of the passes of the Pacific Coast.

TIDAL OBSERVATIONS OBTAINED.

The chief work done in Eastern Canada during the last season was in the region of Cape Breton. Tidal stations were established at Glace Bay, Louisburg, the entrance to St. Peters canal, and Canso harbour. The object of this work, from the tidal point of view, was two-fold; to determine, in the first place, the dividing line between the tides on the Cape Breton coast, which can be referred to St. Paul island, and thus included in the Cabot Strait region; and those of the southeastern coast of Nova Scotia which can best be referred to Halifax as a port of reference. It was found that

Louisburg, St. Peters, and Canso can thus be referred to Halifax. This led to a further important improvement in the tidal data for the whole length of the southeastern coast of Nova Scotia. The tide is so nearly simultaneous on that coast, and its range is so uniform, that it was found possible to correlate the intermediate harbours from Canso past Halifax to Shelburne, as tidal data had already been obtained in a previous season from Shelburne to Cape Sable. The values for this coast could therefore be revised and differences added in the tide tables for low water as well as for high water, thus completing the information throughout this region.

As there are already good determinations of the tide at Sydney, the additional information for Glace Bay and Louisburg will be of service to the coal trade in this region.

TIDE LEVELS.

This tidal work in Cape Breton was kept in touch with the levelling operations which were carried on during the same season by the geodetic levelling parties of the Public Works Department. As a basis for their work the value of mean sea-level at Sydney was computed from two seasons of tidal observations obtained by this survey. The Dominion Steel Company at Sydney and the Dominion Coal Company at Glace Bay and Louisburg have in use datum levels for references which are based upon the tide. With the help of the precise levelling carried out by the Public Works Department, these datums have now been connected and brought into their true relation with the tide, which would be of advantage for pier construction and mining operations in the future. This will be further enhanced by careful determinations of the levels of extreme tides at high water and low water in Sydney harbour, which were obtained from points marked by the Ferry Company, the Marine Slip, and others who give close attention to the extreme levels of the tide.

The low-water datum in use by the city of Sydney, when the tidal observations were first obtained in 1901, was compared with the datum at St. Paul island and also with the observations in the harbour itself. It was thus found to be satisfactory from a tidal point of view and was adopted by this Survey as its datum, to avoid introducing a new reference level. In the re-survey of the harbour made during the season by the Hydrographic Survey, this low-water datum was transferred to North Sydney; and its level there was also checked by the geodetic levelling around the arms of the harbour to the north side. The Public Works Department at North Sydney will also benefit by these, in obtaining a trustworthy datum for reference. By co-operation between these surveys, the levels in the harbour and throughout the coal-mining district in this region are brought into good relation with each other and with the tide.

The levels at St. Peters canal, which were furnished by the Railways and Canals Department, have been brought more fully into relation with the tide by the observations of this season. A series of observations taken by that department in the Bras d'Or lakes at the north end of the canal, have enabled their average level to be determined relatively to the open tide in St. Peters bay.

St. Lawrence Estuary.—A tide gauge was placed last season at Fox river in the entrance to the St. Lawrence, directly opposite Southwest point, Anticosti, where a

tidal station was maintained in the early days of this survey, during five years. The breakwater at Fox river afforded a good site for the gauge, and the location is an advantageous one from a tidal point of view. Observations at this point were chiefly desired by the geodetic levelling of the Public Works Department to check their levelling operations around the Gaspé peninsula, at a point midway between Matapedia and Matane. Another object was to establish a low-water datum in advance of the work of the Hydrographic Survey in this region. There is an obvious advantage in this as compared with a datum which is based on the first spring tides of the season, which it is almost necessary to adopt, otherwise, to reduce the soundings from the beginning. By means of tidal observations in advance of the hydrographic work, a more satisfactory low-water datum can be decided upon, as it can be based on the tidal observations throughout the whole season. Such co-operation between the two Surveys should thus prove advantageous.

Port Borden.—Further data desired by the car ferry to Prince Edward Island between Cape Tormentine and Port Borden were obtained last season from a tide gauge at Port Borden, which was supervised by the Engineer of the car ferry terminals at that point. There are thus four seasons of tidal observations from 1915 to 1918, which are available as a basis for the calculation of the time and height of the tide at Port Borden for the Railways and Canals Department for the benefit of the ferry service. Special methods of calculation have been devised which need not be explained in detail, which enable these tide tables to be calculated from Charlottetown as a port of reference.

Miramichi Bay.—The importance of navigation in this bay may be judged from the fact that over $380,000 has been spent in dredging. Most of the vessels trading there have a draught of 24 to 28 feet. The dredging has provided a channel of 22 feet depth at low tide, and the vessels are expected to take advantage of the tidal rise in getting in and out, as there is a bar known as Horse-shoe bar at the entrance to the bay. The engineers of the Public Works Department, who have carried out the dredging, consider, therefore that an accurate knowledge of when the tide suits these vessels, if put in a readily available form, would not only make their work much more useful, but might obviate the need of deepening the channel further.

The difficulty of dealing with the tide in this bay has been very great. The tide is quite unusual in its character on this part of the New Brunswick coast, as it is chiefly affected by diurnal inequality which follows the moon's declination; and navigators do not well understand explanations which are based on this particular movement of the moon. The harbours and wharves are at the head of the bay; and as the tide has a range of only 6 feet at the most, it is very liable to disturbance from the wind, in passing through the long stretches of shallow water before reaching the head of the bay. To obtain satisfactory observations, it was found necessary to establish a tide gauge at Portage island, where there are no artificial facilities; but this location has at least the advantage of being in proximity to Horse-shoe bar, which is the crucial point for depth. A further difficulty arose because of there being no reference station to which both high water and low water could be referred with advantage on account of the special features which the tide here presents.

An exhaustive investigation was undertaken during the year to ascertain whether there was a tide in any part of the world which presented the same features. It was ultimately found necessary to refer high water and low water independently to different reference stations. A good relation can be obtained between high water at Portage island and the principal station at St. Paul island, if the next following tide is taken as a basis of comparison. The tides thus compared are not those which follow each other in the progress of the tide across the gulf of St. Lawrence, but they are the contrary tides relatively to the transits of the moon. In the case of low water it was eventually found that the only tide having the same characteristics was high water in the strait of Georgia. Without entering upon technicalities or the variations which are allowed for in the calculations, it will suffice to say that satisfactory tide tables can be calculated for Portage island on these lines; and they have thus been prepared for 1920. This is the more fortunate as it would be a difficult and expensive matter to establish a permanent tidal station on Portage island, especially as no one resides there during the winter season, which might make it necessary to pay an observer for his full time, as it is essential to have continuous observations throughout the year for the independent calculations of tide tables at a principal station.

With the new tide tables for Portage island, tidal differences will be given for the harbours in the bay and for the turn of the current in the channel through Horseshoe bar. The data for the rise of the tide have also been carefully revised; and a rule has been arrived at by which the mariner can know which of the tides of the day will be the higher, in relation to the moon's position. The complications which the tide here presents have thus been satisfactorily dealt with, and brought into practical shape for the benefit of navigation.

Pacific Coast.—The new work on this coast has been chiefly in continuation of the observation to obtain data for the calculation of slack water in the passes. At the entrance to Vancouver harbour, observations of the turn of the current were taken during four months last season, to detect any change to the dredging in First narrows. These observations were taken at Prospect point as before. The amount of change in the time at which slack water occurs does not exceed six or seven minutes, as compared with observations in former years. There is now a very satisfactory basis for the calculation from observations during six different seasons.

In the northern passes among the channels at the north end of Vancouver island, observations of slack water were continued chiefly for the benefit of the lumber industry in that region. At Hole-in-the-Wall the observations of the previous season were continued throughout the winter until the spring of 1919, to complete a full year there. This is a very central point in the network of passes and channels; and the turn of the current is very definite there, as the duration of slack water is only four minutes on the average. The advantage of this long series of observations is to obtain a check upon the time of slack water at several other passes in this region, which are within twenty minutes of the time at Hole-in-the-Wall. Observations have now been obtained at all the important passes in this northern region, including Surge narrows and Blind channel; and they are all referred to the full tables of slack water which are published for Seymour narrows. These interior channels and passes are extensively

used in towing large booms of logs, and also by local steamers which supply the lumber camps.

The observations in these passes have involved special difficulty, because the only settlements in the region are in bays which are sheltered from the strong currents and are more suitable for landings. The shores of the passes themselves are practically uninhabited, although the traffic through them may be heavy. It is therefore necessary to build a temporary house or shelter for the observer as a camping place, with special arrangements for transportation and supply of provisions. It is also necessary for the observer to have a chronometer for correct time, as there is no other means of obtaining it. The advantage, on the other hand, is that the observer can give his whole attention to the matter, and he can thus observe all the slack waters which occur during daylight. In the long days of summer three slack waters out of the four in the day can usually be obtained.

A series of tide gauges were placed at harbours amongst the gulf islands, between Victoria and Vancouver during last season. These were established at Cowichan bay, Fulford harbour, Hope bay in North Pender island, and Mayne in Active pass. The result gives more definitely the progress of the tide amongst these islands; and the rise of the tide has also been carefully deduced and brought to a ratio with Sand Heads, as given in the tide tables. This ratio can be applied simply as a percentage of the rise at Sand Heads, which enables the relative amount of the tide throughout the Gulf islands to be correctly known.

At all the harbours on the coast at which tidal observations are obtained, a low-water datum is established and referred to a bench-mark; and the extreme levels of the tide are also ascertained. These are of value for any wharves or other construction work which may be required, as the extreme levels of the tide can be obtained with reference to the local bench-mark which this survey has established.

The permanent tidal stations on the coast have been maintained in continuous operation throughout the year, although there have been unusual interruptions on account of severe storms or because of repairs. An interruption occurred at Victoria during the extensive repairs to the wharf there; and at Port Simpson the gauge was inaccessible for a time because of the long approach to the wharf being carried away in a storm. These tidal stations were inspected, however, and everything necessary was done to maintain uniform levels for the observations and to supply correct time, which up to the present has been one of the chief difficulties.

Hudson Bay.—Further observations were obtained at Nelson from a tide gauge placed under the supervision of the wireless operator there. The data from which the tide tables for Nelson are calculated have been carefully revised, which has resulted in a slight improvement in their accuracy, which shows them to be as closely correct as possible. Tide tables for Nelson are published annually for the four summer months, from July to October.

The data for two additional localities in James bay have been worked out from observations obtained there, by which they have been brought into relation with Nelson. There are now six localities throughout the bay at which the time of the tide is known, as well as the amount of rise. This should afford fairly adequate inform-

ation regarding the tide for any point on James bay which is likely to become a railway terminal, even if it should happen to be intermediate between localities at which the tide has yet been observed; because the difference in time between various points around the head of James bay is not large, and the rise of the tide is also fairly constant.

Information supplied.—A considerable amount of information has been supplied during the year with regard to new data obtained or in answer to requests received. In some cases special reductions were required in order to arrive at the information which was asked for. The following examples may be given to show the varied character of the information which this survey is able to supply.

Around the head of the Bay of Fundy considerable damage has occurred in recent years from extremely high tides during storms. Some method of dealing with the trouble has been considered with care, and after discussion with the Meteorological Service, it was deemed best to draw the attention of the farming interests to the dates at which the highest tides of each month will occur. These tides are indicated in advance in the tide tables issued by this survey. The following explanation regarding the question was given. If a storm should occur at the date of one of these usually high tides, there may be a flooding of the dyked marshes in one locality or another according to the direction which the storm may take. Farmers may therefore reduce the chance of damages, by placing their crops in safety before the date of any such specially high tide in the autumn, in case it should happen to be a storm tide. With the co-operation of the Superintendents of the Experimental Farms at Kentville and Nappan, N.S., this information was communicated to six agricultural societies and farmers' associations in Nova Scotia and New Brunswick around the head of the Bay of Fundy; as well as to several marsh commissioners in that region. An abstract of the information was also sent to local periodicals and to Belchers' almanac for publication. It is hoped that this warning may enable farmers to secure their crops before the dates at which exceptionally high tides are liable to occur in the autumn.

The value of mean sea-level at Sydney, N.S., was communicated to the Militia Department as a basis for level contours in connection with their mapping work. Mean sea-level at Port Hood, on the west side of Cape Breton island, was also determined from a special reduction of the tidal observations obtained there in 1915. This will serve for reference in the geodetic levelling in that region. Another determination of mean sea-level was made by similar calculations for the mining region on Howe sound, British Columbia, at the request of the Geological Survey, as a basis for their levels in that region.

For the region of Miramichi bay, advance information on the lines already outlined will be posted in the custom-house at Chatham, N.B., for the benefit of mariners in the coming season. The true rise of the tide on the bar at the entrance to the bay will thus be known under the varying conditions by which it is modified during the course of the month.

The Hydrographic office in London is always supplied with any new information which results from the work of this survey for publication in the "Sailing Directions," and the British Tide Tables, which are very widely circulated. The principal inform-

ation thus supplied during the year has reference to the currents in the passes of the coast of British Columbia, the tide on James bay, and the comprehensive information regarding Miramichi bay.

PUBLICATIONS.

The tide tables for the eastern coasts of Canada are issued in three editions; one is a complete edition containing all tidal information, and with an issue of 10,000 copies; it was entirely out of print before the end of the year. To meet urgent demands, a few copies were returned from ports to which supplies had been sent. The edition for 1920 has, therefore, been increased to 12,000 in the hope of obviating this shortage in the future. The two abridged editions of pocket size for the St. Lawrence and the Bay of Fundy now amount to a total of 23,000. These are used to supply navigators and fishermen who require local information, and a considerable saving in printing of the full-size edition is thus effected. For the Pacific coast, the edition containing all the information now amounts to 22,000 copies. The abridged edition for the southern part of British Columbia is so much in demand that 10,500 copies are required. This serves to supply the demand for local tide tables in the region of Vancouver and Victoria, as well as the numerous fishermen connected with the canneries of the Fraser river. The demand from the canneries is large, because the catch of fish depends very much upon the time of the tide.

Tide tables for Nelson, in Hudson bay, are published for the months of July to October. With these tables, data are given for localities in James bay, as well as for Hudson strait.

The various editions of the tide tables are supplied without charge to all classes of mariners, ranging from steamship companies to captains of steamers and fishermen. To make them readily accessible to those who require them, supplies are sent to the agencies of the Marine Department, harbour masters, customs officers, and pilot associations, who assist in circulating them.

REPUBLICATION AND SPECIAL TIDE TABLES.

In the tide tables issued by the British Admiralty, eight of our tables for important harbours in Eastern Canada and the Pacific coast are included. Tidal information for the St. Lawrence river is prepared for the publication of the Marine Department, issued by the Ship Canal Survey, for which tide tables for St. Augustin bar are specially calculated. This publication is intended for the pilot service in the St. Lawrence. Special tide tables are also supplied to the Railways and Canals Department for the benefit of the car-ferry service to Prince Edward Island, between cape Tormentine and Port Borden. Tidal information of a more local character is also supplied to places desiring it.

STAFF.

The staff of this survey for the office work at headquarters, as well as for the field work, comprises four in addition to the superintendent. The tidal observers at the permanent stations number five in Eastern Canada and six on the Pacific coast. In addition to these, several others were employed locally during last season in the observation of tides or currents at the localities indicated.

During the winter months the reduction of the observations which are obtained at new localities during the summer season, is made. These are brought into practical shape for calculation purposes, or to afford improved data for slack water in the passes and narrows. The work required in the publication of the five sets of tide tables is also carried out during the winter months. By these arrangements the work is distributed throughout the year; and although the staff is small, it is usually possible to carry forward new work satisfactorily, and to overtake the reduction of the tidal record adequately to assure improvement in the tide tables, from the extended basis thus obtained.

3. HYDROGRAPHIC SURVEY.

Owing to the war in Europe none of the steamers belonging to this survey were available for survey work during the season, but small parties were organized to carry out surveys of various localities in Nova Scotia, Quebec, Ontario, and British Columbia.

Steamer *La Canadienne,* having become unsuitable for the Hydrographic Survey work, was sold at Owen Sound, and has not been replaced. The schooner *Naden,* in New Westminster, being out of commission, was temporarily transferred to the Royal Naval College at Esquimalt, B.C.

The Nova Scotia survey party left Ottawa on April 1, 1918, for Sydney, C.B., and made a survey of that harbour during the months of May, June, July, and August. Upon completion of the work there the party transferred to Halifax and made a resurvey of the Northwest Arm. The party returned to Ottawa the beginning of November.

The St. Lawrence River party left Ottawa on May 11, 1918, and took up their quarters at St. Joachim, Que., to make a resurvey of the north channel, using the survey launch *Brant.* This work will be important in connection with the continuation of the new ship channel being dredged off the east end of the island of Orleans. The most important find in this connection is that the shoal shown on the Admiralty chart, opposite Longue Pointe, does not exist, and that the north channel is, therefore, clear. The party returned to Ottawa on November 13, 1918.

The Lake Superior party left Ottawa on April 18, 1918, and took up camp quarters on the northwest shore of Black bay, where operations were carried on during the season, and the survey of the bay completed. The party returned to Ottawa on October 25, 1918.

The Lake Ontario party, using the launch *D.P.W.,* kindly loaned by the Public Works Department, finished the survey of the approach to Kingston harbour, and returned to Ottawa on September 3, 1918.

On the Pacific coast a re-survey of the Victoria and Esquimalt harbours was carried out. This work was still in progress at the end of the season, and it is hoped will be finished during the present year.

The automatic gauges have been very efficiently maintained during the past year. No new ones were established.

Attached to this report are the following monthly mean-water surface elevations for 1918 referred to United States datum or mean sea-level:—

Monthly Mean Water Surface Elevations of the Great Lakes for 1917.
Monthly Mean Elevations of St. Lawrence river at foot of Lock 25, January 1 to December 31, 1918.
Monthly Mean Elevations of St. Lawrence river at foot of Lock 24, January 1 to December 31, 1918.
Monthly Mean Elevations of Lake St. Louis at Pointe Claire, January 1 to December 31, 1918.
Monthly Mean Elevations of St. Lawrence river at Verdun, May 1 to November 30, 1918.
Monthly Mean Elevations of St. Lawrence river at Montreal (foot of lock 1), May 1 to November 30, 1918.
Monthly Mean Elevations of St. Lawrence river at Montreal (Laurier pier), May 1 to November 30, 1918.
Monthly Mean Elevations of St. Lawrence river at Longue Point, May 1 to November 30, 1918.
Monthly Mean Elevations of St. Lawrence river at Varennes, May 1 to November 30, 1918.
Monthly Mean Elevations of St. Lawrence river at Verchères, May 1 to November 30, 1918.
Monthly Mean Elevations of St. Lawrence river at Lanoraie, May 1 to November 30, 1918.
Monthly Mean Elevations of St. Lawrence river at Sorel, January 1 to December 31, 1918.

During the past year the following new engraved charts were issued from this office:—

No. 215.—Pointe des Monts to Father Point.
No. 313.—Approaches to Skeena river.
No. 410.—Bedford Basin,
No. 411.—Egg Island to Pennant Point.

The following new photolithographed charts were issued:—

No. 65.—Toronto Harbour.
No. 67.—Burlington Bay.
No. 114.—Fort William and Port Arthur.
No. 413—.Bathurst Harbour.
No. 414.—Plans of harbours in the Bay of Fundy.
No. 415.—Sydney Harbour.

The following re-prints of former issues have been published:—

No. 72.—Goderich Harbour.
No. 82.—Cape Rich to Cabot Head.
No. 83.—Waubaushene to Western Island.
No. 84.—Parry Sound and approaches.
No. 85.—McCoy Island to Colline Inlet.
No. 87.—Clapperton Island to Meldrum Point.
No. 88.—St. Joseph Channel.
No. 89.—Penetanguishene Harbour.
No. 80.—Plans of harbours in Lake Erie.
No. 107.—Coppermine Point to Cape Gargantua.
No. 305.—Masset Sound and Inlet.
No. 140.—Lake Winnipeg, Red River to Berens River.
No. 312.—Granby Bay, Alice Arm and approaches.
Index map of charts issued by Hydrographic Survey of the Great Lakes.

The charts of the International Waterways Commission, showing the boundary line between St. Regis, Que., and Pigeon bay, were issued in containers.

MONTHLY Mean Water Surface Elevations of "Great Lakes" for 1918, by Automatic Water Gauges, and referred to Mean Sea-level.

Location		Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
		Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet
Lake Superior	Port Arthur	601·78	601·65	601·53	601·46	601·76	602·15	602·38	602·39	602·40	602·39	602·44	602·36	602·06
	Michipicoten Harbour	601·83	601·51	601·48	601·47	601·76	602·15	602·35	602·45	602·49	602·43	602·54	602·42	602·07
	Above Locks	601·07	600·96	600·87	600·92	601·15	601·61	601·88	601·87	602·04	601·89	602·05	601·93	601·52
St. Mary's River	Below Locks	582·90	582·71	582·92	582·17	582·51	582·75	582·47	582·47	582·49	582·31	582·08	581·65	582·45
Georgian Bay	Collingwood	580·65	580·83	580·95	581·16	581·58	581·88	581·88	581·63	581·46	581·06	581·15	580·82	581·25
Lake Huron	Goderich	.....	.....	.....	.....	.....	581·91	581·90	581·64	581·49	581·14	581·21	580·90	.....
	Isle Aux Pêches	573·72	574·29	574·11	573·91	575·04	575·48	575·58	575·57	575·36	575·12	574·87	574·94	574·83
Detroit River	Fighting Island	573·25	573·64	573·70	573·25	574·24	574·63	574·77	574·79	574·60	574·39	574·12	574·19	574·13
Lake Erie	Port Colborne	571·76	571·40	571·94	571·77	571·90	572·29	572·48	572·29	572·36	572·07	572·26	571·97	572·04
	Port Dalhousie	.....	.....	.....	.....	.....	247·02	246·81	246·49	246·17	246·00	246·00	246·03	.....
Lake Ontario	Kingston	246·03	245·87	246·56	247·05	247·01	246·93	246·77	246·35	246·12	245·92	245·92	246·81	246·36
	Toronto*	246·10	246·00	246·67	247·35	247·31	247·17	247·92	246·56	246·24	246·11	246·09	246·11	246·55

*Records are taken by Toronto Harbour Commission.

MONTHLY Mean Water Surface Elevations of St. Lawrence River, for 1918, by Automatic Water Gauges, and referred to M.S. Level.

Locatiou.		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean
		Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet	Feet
St. Lawrence River	Iroquois Canal Below Lock 25	227·79	227·31	228·53	229·60	229·79	229·72	229·55	228·96	228·63	228·23	228·38	228·08	228·71
	Morrisburg Canal above Lock 24	224·58	224·23	225·10	226·06	226·20	226·13	226·00	225·52	225·22	224·83	224·93	224·71	225·29
Lake St. Louis	Pointe Claire	69·39	68·79	69·03	70·89	70·64	69·85	69·39	68·47	68·31	68·98	69·65	69·07	69·37
Laprairie Basin	Verdun	.....	.....	.....	.....	35·36	34·99	34·82	34·47	34·41	34·66	34·91	.....	34·87
St. Lawrence River	Montreal Below Lock 1	.....	.....	.....	.....	24·32	22·68	22·17	20·46	20·53	21·72	23·02	.....	22·13
" "	Montreal Laurier Pier	.....	.....	.....	.....	23·20	21·52	21·08	19·40	19·50	20·67	21·98	.....	21·05
" "	Longue Pointe	.....	.....	.....	.....	22·99	21·24	20·82	19·10	19·21	20·40	21·76	.....	20·79
" "	Varennes	.....	.....	.....	.....	21·72	19·89	19·43	17·61	17·78	19·03	20·47	.....	19·42
" "	Verchères	.....	.....	.....	.....	20·53	18·55	18·15	16·29	16·50	17·76	19·24	.....	18·15
" "	Lanoraie	.....	.....	.....	.....	18·88	16·84	16·40	14·48	14·77	15·99	17·47	.....	16·40
" "	Sorel	18·04	17·64	19·53	22·02	18·22	16·25	15·89	14·03	14·30	15·49	16·85	16·43	17·06

4. STORES BRANCH.

The Stores Branch under the original organization which is still maintained, is divided into two divisions, viz., Purchasing and Contract, and Storekeeping. The functions of the former are the execution and supervision of all purchases and contracts, including the chartering of vessels, the erection of buildings and other permanent structures for water supplies, electric light and power, telephone service, etc., and for the victualling of ships, where the victualling is not done by the department. The functions of the Storekeeping Division are the supervision and control of all matters pertaining to the provision, receipt, care, issue, and accounting of stores for all ships and establishments, including the victualling of ships where the victualling is done by the department. The work of the two divisions, though entirely separate in function, interlocks so frequently and to such an extent that for purposes of report the activities of the branch will be treated as a whole, regardless of the organization.

The work of the branch has been very onerous during the period of hostilities, having increased from a state of almost complete inactivity prior to August, 1914, to one involving transactions amounting to millions of dollars at the close of the war. On account of its close relationship and direct bearing on the operations of the various other branches and phases of naval work, the growth and development of the Stores Branch are perhaps best illustrated by the comparative increase in the number of ships of the Canadian and other services, stationed at Halifax and Esquimalt or drawing supplies from either dockyard, from the early days of August, 1914, up to the time of the signing of the armistice, on November 11, 1918.

Before the outbreak of the war, not more than ten vessels of the Naval and auxiliary services, which, with the Royal Naval College of Canada, made up the full quota of Canadian ships and establishments served from Halifax. At Esquimalt, the supplying of six vessels and the fitting up of the Canadian Arctic Expedition comprised the extent of store work at that point. In addition to the foregoing, Imperial ships called at either dockyard from time to time, but not at frequent intervals.

During the last year of the war, a year which is fairly representative of all activities of the three preceding years, the number of ships and services was greatly increased. At Halifax, continuous service was rendered to 188 Canadian ships and 29 other Canadian establishments, and occasional service to 95 Imperial ships and 63 ships of Allied Governments, making a total of 375 ships and establishments. At Esquimalt, the numbers are, for continuous service, 20 Canadian ships, including the smaller craft, 13 other Canadian establishments, and 3 miscellaneous services, and for occasional service, 7 Imperial vessels, making a total of 43.

The expansion of naval activities at the different bases and at different times during the war period, consequent upon the ever-changing conditions and necessary modifications in naval policy, made it necessary to extend the organization of the branch to a considerable extent. In the main, however, the original systems have been adhered to.

Throughout, the principal aim of the branch has been to supply and equip men-of-war with every possible expedition, and to render the maximum assistance possible for their efficient maintenance. This having been the main and all-important function, war ships of the British Admiralty and Allied Governments, as well as of the Canadian Naval Service, have received first consideration. It is gratifying to report that the

extension of facilities afforded the Imperial Service, and the large increase in the value of supplies issued to their ships and establishments, have brought about a closer relationship between the department and the British Admiralty. Considerable difficulty has been experienced in providing sufficient quantities, and particularly in procuring the quality of stores required by these ships, due essentially to the market conditions which obtained during the war and to the difficulties of transportation consequent upon the large movement of stores and materials to the seaboards. Notwithstanding these difficulties, adequate reserves of all necessary stores and equipment, and guns and ammunition for the fighting forces, have been maintained, and the maximum facilities afforded to all ships and vessels of war when at Canadian ports. Inasmuch as no serious delays have occurred in supplying these requirements, whether for maintenance or carrying out necessary refits, the chief object and purpose of the organization have been fulfilled in a satisfactory and efficient manner.

In addition to men-of-war and other naval establishments, service has been rendered to all the auxiliary services connected with the department. These include the Air Service, Examination Service, Radiotelegraph Service, Fishery Protection Service, Hydrographic Service, Tidal and Current Surveys, Live-saving Service, Fish-breeding Service, and the various other Fishery establishments throughout the country. At the outset, when the task of supplying these services was undertaken, disparity between the services themselves and the nature of their requirements presented no small difficulties. The policy of standardizing their requirements as far as possible was adopted, with the result that considerable progress has been made in this direction with gratifying results.

At the beginning of hostilities the reserves at both Halifax and Esquimalt dockyards were totally inadequate for the requirements of the service under war conditions, due wholly to the fact that there was no naval activity immediately preceding that time. Steps were taken at once to distribute the stores available where most required, and also to provide in the shortest time possible additional quantities. As far as possible provision was made each year thereafter for requirements based on the consumption of the previous year or two years. Changes in policy, additions to the fleets, or other unforeseen events which occurred from time to time, necessitated continual re-adjustments. On the principle that a considerable margin of safety was essential under the then existing conditions, an effort was made to maintain sufficient quantities to meet all emergencies. The state of the market for practically all commodities being abnormal, and deliveries of quantities required at short notice being exceedingly uncertain, the difficulties in providing this service were very great. The magnitude of this work involved is apparent from the great variety of stores which are handled by both dockyards, and of which the following is a general list of descriptions: Provisions; uniforms and clothing, and materials for making these; medical supplies, surgical instruments and hospital equipment; lumber; metals of many kinds and in every state of manufacture; hardware and tools; textiles and cordage; packings and canvas goods; paints, lubricating and fuel oils; leather goods, brushes, furniture and furnishings; tackle, charts, meteorological and navigational instruments; and other miscellaneous supplies of almost every description; fuel; and ordnance, ammunition, torpedoes, and torpedo stores. The values of stores

carried at the dockyards has increased from year to year with the growth of the service, as follows:—

Halifax Dockyard—	
Fiscal year, 1914-15	$ 376,000 00
" 1915-16	469,618 00
" 1916-17	488,150 00
" 1917-18	1,397,620 00
" 1918-19	2,469,492 00
Esquimalt Dockyard—	
Fiscal year, 1914-15	$280,000 00
" 1915-16	351,611 00
" 1916-17	534,816 00
" 1917-18	644,795 00
" 1918-19	972,367 00

The value of transactions handled by both dockyards is shown in the following figures, being a statement of receipts and issues during the fiscal year 1918-19, as well as for the entire war period:—

	Value.	Number.	Value.	Number.
Value and Number of Receipts, Halifax—				
Fiscal year, 1918-19	$4,043,098	13,500	$ 830,223	3,970
During war period (1914-15 to 1918-19 inclusive)	8,738,540	40,052	2,686,423	17,644
Value and Number of Issues—				
Fiscal year 1918-19	2,971,225	36,957	479,229	14,189
During war period (1914-15 to 1918-19 inclusive)	6,362,641	91,887	1,970,226	61,773

The purchasing work of the branch, particularly, has increased and developed to a very large extent, and notwithstanding the difficulties in market conditions already referred to, highly satisfactory results have been obtained in securing not only the quantities required, but also in the successful selection of the desired qualities and patterns peculiar to naval requirements. The following table gives the value of purchases executed during the four years of the war:—

1915-16	$ 2,485,269 00
1916-17	7,605,019 00
1917-18	10,074,643 00
1918-19	8,214,415 00

Though considerably smaller in amount, the purchases for the year 1918-19 represent a large increase proportionately for the first eight months of the year, as after the 11th November extensive purchasing practically ceased. The values of the various kinds of stores purchased during the year are as follows: Provisions, $2,056,098; clothing, and clothing materials, $1,758,599; naval stores (including timber, metals and metal stores of all kinds, textiles, electrical stores and scientific instruments, miscellaneous packings, paints, etc.), $2,392,033; fuel, $1,341,602; medical stores, $29,064; ordnance, ammunition, and torpedo stores (approximately), $20,254; stationery and printing, $202,412; and miscellaneous purchases, $414,362. Contracts have been maintained on both coasts for supplies of fresh provisions for the convenience of ships of this service, as well as those of the Imperial and Allied Governments. Expenditures under these contracts are included in the above amounts.

The Imperial authorities have availed themselves of the facilities at the dockyards for keeping large supplies of stores for issue to ships operating in Atlantic and Pacific

waters. Other assistance has been afforded in connection with the storage and accounting of these stores. During the year under review arrangements have been completed for the taking over of all Admiralty stores in Canadian dockyards for issue from Canadian stock to all ships requiring these supplies. This procedure has simplified very appreciably the work of handling and accounting of the stores in question.

A very important phase of the assistance rendered to the British Admiralty has been the supply of large quantities of stores to Hong Kong and Bermuda, the former from Esquimalt and the latter from Halifax dockyard. This necessitated the provision of considerably larger reserves than would have otherwise been necessary, as well as the making of adequate arrangements to ensure the most efficient service possible.

The inauguration of an anti-submarine campaign on the Atlantic coast towards the end of the year 1917, involving the commissioning of a large number of patrol vessels, trawlers, drifters, and other craft, necessitated a radical reorganization of the supplies system in order to cope with the large volume of small requirements. Unlike large cruisers and other men-of-war, vessels of the trawler and drifter type, though not requiring the same large quantities of stores for maintenance, have to replenish much more frequently, at least once a month, owing principally to their limited stowage space. The difficulties of conducting a large supply distributing centre on a retail, as well as a wholesale, basis being too great to warrant such an undertaking, supply depots were organized at Sydney, C.B., and at Halifax, N.S., to take care of the immediate requirements of the patrol service. All necessary arrangements were completed for the shipment, receipt, custody, and issue of stores at the depots, and a warrant officer placed in charge at each depot. By these means it was possible to meet all their requirements with the required despatch, to maintain an intelligent check on their demands, and to provide an adequate system of store accounts, even in the case of issues to the smallest vessels in charge of officers wholly inexperienced in store procedure generally and in store accounting in particular.

Owing principally to the unsatisfactory results obtained in victualling vessels of the Fishery Protection and Patrol Services under the contract system, whereby stewards, in consideration of a daily rate for each member of the ships' complements, supplied all provisions, it was decided to introduce the general messing system in all these vessels. The change to the new system was effected in May, 1918, and thenceforth all provisions were supplied by the department in accordance with a standard ration scale. On the development of the patrol service, victualling bases were established in charge of accountant officers for the purpose of supplying provisions, clothing and mess traps to all vessels attached to the bases. Direct control of the individual stewards and the operation of a central store accounting system are the chief features of the new system. The experiment soon proved an entire success, and a considerable saving in the cost of victualling was effected, owing to the department's ability to purchase to better advantage than stewards on their own account, and to the greatly increased supervision under the new system. The actual result achieved was the victualling of the entire personnel of the service at the rate of 52·86 cents per man per diem for the fiscal year 1918-19, which under the abnormally high-price level obtaining, is regarded as a very

creditable achievement, particularly when it is considered that the rates paid under the contract system at the time of its abolition were 65 cents for men and 75 cents for officers. The total cost of victualling for the year amounted to $694,768.70.

One of the most essential features of stores work during the war was the maintenance of large reserves of steaming coal at both dockyards for ships of the Canadian, Imperial and Allied Governments. The total receipts and issues for the year under review, and for the war period, are as follows:—

	Tons.
Receipts and Issues during Fiscal Year 1918-19—	
Receipts—	
At Halifax	57,695
Esquimalt	7,995
Issues—	
At Halifax	53,952
Esquimalt	7,952
Receipts and Issues during Four Years of War—	
Receipts—	
At Halifax	243,170
Esquimalt	63,626
Issues—	
At Halifax	235,345
Esquimalt	62,910

By far the greater part of the above quantities was Admiralty coal, and the value thereof is not included in the stated value of purchases, receipts, and issues.

In addition, the following quantities of Canadian coal were handled on direct issue from contractors, viz:—

	Tons.
During the Fiscal Year 1918-19—	
At Halifax	72,576
During Four Years of War—	
At Halifax	396,752
Esquimalt	56,640

On account of the large number of new ships added to the Naval establishment from time to time, it was necessary to prepare established allowances for engineers', carpenters', boatswains', and gunners' naval and ordnance stores for each ship or groups of ships. By these means, ships are restricted to certain definite quantities and qualities for their general requirements, thus effecting a considerable economy and reducing the variety of stores handled to a minimum. For the purpose of maintaining a thorough check at all times to protect Government property from loss due to unnecessary expenditure, neglect or theft, ships and establishments, including the dockyards, make an accounting of all stores received and expended. These accounts when closed are forwarded to Headquarters for audit. During the last year a large number of accounts have been audited with satisfactory results.

Large quantities of old stores, chiefly in the nature of scrap, have been sold both by public tender and by auction from Halifax dockyard from time to time, as additional storage space was required and as the most favourable market conditions presented themselves for this class of materials. The stores sold included steel, iron, cordage, phosphor bronze, rubber, wire rope, ships' boats, rags, and a variety of other stores no longer suitable for issue to, or use in, the service. The values realized at these sales have been in keeping with the market value of the materials offered at the time of sale.

The system of biennial stocktaking, whereby the stocks at both dockyards are completely reviewed in the course of two years, has been satisfactorily maintained throughout the war period. Particularly in the case of Halifax, the task of conducting these stocktakings proved very difficult, owing chiefly to the disorganization caused by the regrettable disaster of December 6, 1917, and to the pressure of other work.

5. CANADIAN ARCTIC EXPEDITION.

The Canadian Arctic Expedition, under the command of V. Stefansson, left its outfitting station at the Navy Yard, Esquimalt, B.C., the spring of 1913, and its exploratory work may be considered to have been finished November 6, 1918, when the last field party, under the charge of Storker Storkersen, landed near the Colville delta on the north coast of Alaska, returning from a seven-month sledge survey of the unknown regions lying to the north. But in another sense the expedition is not yet over, for the five men who composed Storkersen's party had to winter on the north coast of Alaska, and their return to Victoria or Ottawa is not expected before September, 1919.

The reports of the Department of Naval Service have from time to time carried an account of the progress of the expedition. In part these have been based on written reports from Mr. Stefansson to the department, but there have also been some comprehensive summaries of certain sections of it by the officers who commanded them, given the Government after those sections had returned from the north. These are notably the report of Capt. R. A. Bartlett, in charge of the *Karluk* section of the expedition, in the report for the year ending March 31, 1915; of Dr. R. M. Anderson, in charge of the *Alaska,* or southern section; and of Mr. George H. Wilkins, in charge of the *North Star* and *Mary Sachs* section, in the report for the year ending March 31, 1917.

As these reports have already been published, and as a full narrative of the work of the expedition is in preparation, the present summary will not concern itself, except incidentally, with anything already covered, and will take up the narrative from the point where it is left off on page 30 of the report of the Department of Naval Service for the year ending March 31, 1918.

By the fall of 1917 all sections of the expedition had returned south except that under Mr. Stefansson, aboard the *Polar Bear.* The *Polar Bear* also made an attempt to reach the Pacific that year, but, through accidents that were set forth in the report for 1918, she was frozen in on the north coast of Alaska.

When, in the fall of 1917, Mr. Stefansson found himself on the north coast of Alaska with a crew of men whose pay in any case was running on and who had to be fed and clothed if they were idle, at an expense only a trifle less than would be the case if they engaged in active exploratory work, he decided to do during the winter and following spring whatever geographic exploration was possible. The most inviting field lay to the north of Alaska, where the ocean was unexplored and where, about two hundred miles off shore, the charts carried the hypothetical Keenan Land, which was said to have been seen long ago by an American whaler who had gone far north beyond the regions ordinarily visited by whaling ships. This exploration would, of course, have to be by sled. Their experience of the previous four years had shown

that parties skilled in methods of hunting and in the other requirements necessary for living safely and comfortably in the Far North could secure food, fuel, and other necessities for themselves indefinitely on any sea ice they had visited, and presumably on any sea ice whatever in the Arctic regions. He therefore formed the plan of travelling with a small party to a point about 200 miles farther north on the Beaufort sea than the course followed by the *Karluk* in her drift during the winter of 1913-14. This point would be the approximate location of Keenan Land, which they were more than doubtful of finding. Should the land be there, they would undertake the exploration of it, while the *Polar Bear* with her crew sailed south, for they had already demonstrated that the support of a ship is not necessary to the safety of a party engaged in ice exploration. But if, as seemed far more likely, Keenan Land should not prove to be where it was supposed to be, and if instead there were only moving ice, they would select a cake of ice of suitable thickness and surface area upon which to camp for a period of a year. Mr. Stefansson's idea was that such a cake would probably drift in a course roughly parallel to that taken by the *Karluk* four years before, and roughly two hundred miles north of the *Karluk* course. At the end of a year he thought it likely they should find themselves north of the eastern portion of Siberia, and in February, 1919, the party would leave their winter base and, as the months of March, April, and May are the best for north polar ice travel, they would by June land somewhere on the coast of Asia. As this is in the main a comparatively thickly settled coast, with large herds of domestic reindeer here and there, and numerous trading stations, there would have been no difficulty encountered after landing.

In preparation for this projected exploration there were two main things to be done, one was the building of several suitable sledges at the winter quarters on Barter island, and the other was the purchase of thirty or forty additional dogs in the delta of the Mackenzie, two hundred miles to the east. Certain supplies also had to be purchased from Herschel island and from the American traders at Demarcation point. These were, however, in the main, supplies which would have been needed irrespective of the exploratory work. The work of making the sledges, as well as the sewing of clothing and other preparations of that sort, was under the charge of Captain Hadley, of the *Polar Bear,* who received the best possible assistance from his entire crew. Storkersen took charge of the necessary hunting, and also of the freighting between Herschel island and Barter island, while Mr. Stefansson went to the delta of the Mackenzie to purchase dogs. While at Herschel island and in the delta Mr. Stefansson received the greatest kindness and much valuable assistance both from the officers of the Royal Northwest Mounted Police and representatives of the Hudson's Bay Company, as well as from other traders and resident whites.

By the first part of January all preparations were well forward. The party had nine sleds at its disposal. Their quality was, on the whole, better than those previously in use by the expedition. They further had about sixty dogs, which was nearly double the number of good dogs they had had at any time before. The men available were also more experienced and averaged better than hitherto, and the prospects in every way were excellent.

But about the ninth of January the situation was altered. Mr. Stefansson was taken with a fever which at first was not recognized but which proved to be typhoid. During the first four days of the illness he walked sixty miles, most of the distance against a strong head wind, and when he arrived at the Herschel island Mounted Police barracks the fever was already fully developed, and may have been more serious than otherwise on account of the exertion. As it was not at first evident that the disease was typhoid, he was in continual hope of getting better and being able to take command of the ice party. It had been his purpose to leave shore by the full moon of January and this would have been the ideal time, but the full moon of February was not too late and Mr. Stefansson for some time planned to make the start at that date. In February, however, it became evident that he would be unable to do anything that year, and the command of the ice party was handed over to Storker Storkersen. Unfortunately, he, too, was slightly ill the first part of February which, with other things, delayed his start so that he did not finally get away from Cross island on the north coast of Alaska until March 15, when he started north with twelve men besides himself, eight sleds, and forty-six dogs.

The soundings taken by Storkersen on this journey will be especially valuable when fully tabulated but they are not as yet available, except a few. The only party which had preceded him in this region was that of Leffingwell and Mikkelsen, which had carried sounding wire of only 603 metres. Storkersen had about 5,000 metres of wire. At 71° 22′ N., 147° 40′ W., he got 1,640 metres. Five miles farther north he got 2,537 metres. When he arrived at 72° N. he was at the farthest point reached by Leffingwell and Mikkelsen and got a sounding here of 2,500 metres, but he did not get bottom because the current was so strong that it carried his sounding wire out at an angle and put such a strain on it that he did not dare to let any more of it out for fear of breaking.

From this point Storkersen sent back, on April 4, his first support party, consisting of Herman Kilian, in command, and two Eskimos, Pausanna and Tuklak. This was the second of their ice journeys where they had had Eskimos in their service. During the first three years none of them dared to go, for they believed that the sea at a great distance from land would not be supplied with food, and that they would starve; but, after seeing ice parties return safely three different years, three Eskimos volunteered to go with Mr. Stefansson in 1917, and he took one of them. The stories of this Eskimo when he got back ashore were a great deal more convincing to his countrymen than the accounts of white explorers had been, and hereafter Mr. Stefansson does not think that any one will have trouble should he want to engage Eskimos for sea-ice explorations, for they now understand clearly that game is likely to be abundant on the sea ice, no matter what the distance from shore.

When Storkersen's party got to about 73° N. and 147° W., they were near where Keenan Land was supposed to be, but saw no signs of it and found added evidence of its absence in the great depth of water, about 10,000 feet (over 3,000 metres). From 73° N. and 148° 30′ W., Storkersen sent back his second support party under command of Aarnout Castel, and consisting, besides Castel, of Karsten Andersen, Fred Wolki, and the Eskimo, Emiu, commonly called Split-the-Wind. Both the support parties arrived safely ashore, Castel's party getting to land the first week of May.

Upon the return of the second support party, Storkersen had with him four men, Lorne Knight, Martin Kilian, G. G. Gumar, and Gustav Masik. He had two sledges, eighteen dogs and provisions for about six weeks. Their camp was on an ice cake about seven miles wide and fifteen miles long. The summer was spent comfortably, and there was no scarcity of game. Storkersen reports killing ninety-four seals and nine bears, and he could have killed more had there been need. The party saw no danger during the summer nor did they anticipate any for the coming winter, and Storkersen reports that his men agreed with him that this method of exploration was, in their opinion, the best for the investigation of this area of which they had any knowledge. A plotting of their drift during the summer shows rather more northing and less westing than was expected, but seems to have been in general under control of local winds. Besides the seals and bears an abundance of other animal life was observed in the form of fish, Beluga whales, and both land and sea birds.

Towards the end of the summer, Storkersen was unfortunately attacked by asthma which continued getting more serious until, on the 5th October, the party decided to return ashore on this account. October is one of the worst months of the year for sledge travel in these latitudes. The innumerable passes of ice into which the surface of the ocean has been broken during the summer have not been soundly cemented together as yet by the oncoming frost; the lanes between the cakes are covered with thin ice; this is rendered treacherous by a thick blanketing of new-fallen snow, which not only prevents rapid freezing but disguises the character of the places beneath, and thus makes them dangerous; the darkness of winter is coming on rapidly, and the night is much longer than the day. Nevertheless, Storkersen tells the whole story of his journey ashore in one sentence: "We started on the 5th October and landed near the Colville delta on the 6th November without any trouble." When one remembers that this was a journey of over one hundred miles over moving ice and with insufficient daylight, and that one of the party was ill, it brings out strikingly with what safety and ease polar sledge journeys can now be accomplished.

When dependence is had on game that is secured by the way, the sledges are always light; breakages of sleds are, therefore, not so likely to occur in rough ice nor is the weak young ice so likely to break under their weight. The speed of travelling is greatly increased, as well as its safety. Being well fed, the dogs are always eager to pull, which not only relieves the men of the work of helping the sleds, but even enables them to ride at times should they wish. Storkersen does not say so, but undoubtedly a considerable part of the month used in the journey ashore consisted of long delays beside leads of open water, and of protracted periods, probably of days at a time, when the party remained in camp because of thick weather. Undoubtedly the average speed on days of actual travelling was far higher than appears from a mere statement of the mileage and the time consumed.

Although the information brought back by Storkersen's party as to the depth of the ocean, the direction of winds and currents, the condition of the ice, the abundance of animal life, and the like, will doubtless be found valuable when published, his journey is perhaps most important in emphasizing the value for polar exploration of the method under which it was conducted. His party spent seven months on moving ice, more than five months of which they depended for food and fuel on game exclusively,

and they came back agreed that they could have continued to do this indefinitely. In other words, by this method the length of Arctic journeys is no longer limited in time or distance by the amount of food carried or the perfection of the method used for carrying food.

During Mr. Stefansson's three months' illness at Herschel island, he received kindnesses from nearly everyone in the place, and the citing of any special names would, therefore, be invidious. By the end of March the opinion had grown that his illness was likely to end fatally unless he were able to get away from the island. All the dogs and men of the expedition that could be useful in travelling were out on the sea ice, and not available. In this emergency Inspector J. W. Phillips, of the Royal Northwest Mounted Police, offered to manage the undertaking for Mr. Stefansson if he wanted to be hauled across the mountains to the hospital at Fort Yukon. He accepted this very gladly. Inspector Phillips detailed Constable Brockie to take charge of the party, gave them all the police dogs, hired as many other dogs and sledges as were necessary, as well as Eskimos to help Mr. Brockie, and on April 3 they started south from Herschel island with three sledges. Mr. Stefansson had been in bed for nearly three months, and was naturally very weak, and the task Mr. Brockie and his party had before them was, therefore, neither the easiest nor the most pleasant. The Rev. Henry Fry, of the Church of England mission, volunteered to go with them, and accompanied the party on the first day. During that day, however, Stefansson's condition improved so markedly over what had been the case while he was still in a house that Mr. Brockie and he agreed it would probably be unnecessary for Mr. Fry to accompany them further. The journey to Fort Yukon took altogether twenty-seven days. During that time Mr. Stefansson gained thirty pounds of weight, and on arrival at the hospital he was able to get out of the sled at a considerable distance from the building and walk to it without assistance.

At Fort Yukon and on the way thither, as at Herschel island, everyone was kind and serviceable. In Mr. Stefansson's final report of the expedition he hopes to do what justice he can to those who helped him on the journey and received him at the end of it.

After a summer at Fort Yukon and a complete recovery under the care of Dr. Burke of the hospital, Mr. Stefansson proceeded up the Yukon river in the autumn, arriving at Victoria in September, 1918.

With Storkersen off on the ice and Mr. Stefansson sick in the interior of Alaska, all the planning and much of the execution of the spring work fell to Captain Hadley. Besides the preparation for the voyage out, he found time to do, at Barter island, a considerable amount of scientific collecting, chiefly zoological and archaelogical.

In the harbour at Barter island an accident occurred to the *Polar Bear* which is nearly, if not quite, unique in polar exploration. She had been unloaded in the fall to make her lighter and was, as is customary with such vessels, frozen solidly into the ice except that a hole was kept open around her rudder and propeller. During the winter a heavy ridge of pressure ice had heaped up against the land by the force of winds and currents, and the crevices in this ridge had been closely packed with wind-driven snow. Five miles to the east, well known but unfeared, was the mouth of a small river. Shortly after the spring thaws commenced this river broke up and the

waters at its mouth could be seen from the ship at some distance to the east when people went to sleep in the evening. Everyone was living in a house on shore, for the time had not yet come for occupying the ship. During the night a strong wind blew up, probably accelerating the thawing of the snow and thus bringing down more water, but mainly driving what water there already was at the mouth of the river west towards Barter island. To the north this water was effectively dammed by the ridge of pressure ice, and before anyone suspected it, four feet of water surrounded the *Polar Bear*. Had she remained firmly frozen in the ice, she would have been filled by the rising water and sunk, but what happened was that her own buoyancy tore her loose from her bed, removing at the same time a portion of the keel so that she leaked badly. It was a matter of the greatest difficulty for Captain Hadley and his crew to repair this damage and they were able to do so only in a temporary manner. They sailed her during the summer to Nome, Alaska, where she was put on the ways and examined as a preliminary to the Pacific ocean voyage to Victoria. Under the direction of Captain Ross, of the United States Life-saving Station at Nome, the ship was carefully examined and found to be of doubtful seaworthiness. The season was already too late for adequate repairs in Alaska. The *Polar Bear* was therefore left in the ways at St. Michaels for the winter, while Captain Hadley brought his crew to Victoria, where they were paid off in October.

The discharge of the crew of the *Polar Bear* left Mr. Storkersen and his party of four men the only members of the expedition still in service. With assistance from the Royal Northwest Mounted Police they are wintering safely in the vicinity of Herschel island. It is not known at present whether they will come south by way of the Mackenzie river to Edmonton or aboard some whaling or trading ship around Alaska and by way of the Pacific to Victoria.

Mr. Stefansson is preparing a complete and detailed report giving the history of the expedition, and also full particulars of the results obtained from the exhaustive scientific research undertaken during the five and one-half years that the expedition was in the Arctic regions. The public will be informed through the press when the final report will be available for distribution.

6. FISHERIES PROTECTION SERVICE.

The number of ships actually belonging to the Fisheries Protection Service on April, 1918, was nine, but some of these had necessarily been absorbed by the Naval Service for work connected with the defence of the coasts of Canada, owing to the war.

Now that hostilities have ceased and demobilization is well commenced, it is proposed to reorganize the service by replacing some of the vessels, which have outgrown their usefulness, with some of those built for coastal patrol during the war.

I regret very much to have to report the loss, on the west coast, of the C.G.S. *Galiano*, sister ship to the *Malaspina*, a vessel built at Dublin, Ireland, in 1913, especially for this service.

On the 30th October, 1918, the wireless station at Triangle received a message from *Galiano* asking for immediate assistance. A heavy southeast gale was raging

at the time. Immediately the message was received all ships in the vicinity and approaching the direction of *Galiano* were notified, but nothing further was heard or seen of her. The Commanding Officer, Lieut. R. M. Pope, who has commanded the vessel since she arrived in British Columbia waters, together with thirty-seven officers and men, were lost with the ship.

C.G.S. Canada.—Is a twin-screw steel ship, length 206 feet, beam 25 feet, draught 11 feet 2 inches, registered tonnage 411 tons, speed 16 knots. When on fisheries protection duty she is armed with two 2-pdr. Q.F. and two 3-pdr. Hotchkiss guns. The vessel is electrically lighted throughout, and is fitted with a powerful searchlight. Her complement is sixty officers and men, all told, and she was built by Vickers, Sons & Maxim, Limited, England, in 1904. She was commanded during the year by Lieut. Commander C. J. Stuart, R.N.R.

This ship is commissioned under the White Ensign, and when paid off will undergo a thorough refit before returning to the Fisheries Protection Service.

C.G.S. Curlew.—Is a single-screw vessel, length 116 feet 3 inches, beam 19 feet 8 inches, draught 11 feet, speed 10½ knots, and registered tonnage 157·85 tons. Her complement is twenty-two officers and men, all told, and she was commanded by Captain W. J. Milne. This vessel was utilized for naval work when required. When not engaged on such duties, she performed regular Fishery Protection patrols in the Bay of Fundy, and along the southwest coast of Nova Scotia. The spring fishing was reported to have been much later than usual owing to the backward season.

The vessel, while performing her regular duties, rendered assistance to the crew of the schooner *Derfontein,* destroyed by enemy submarine action. It also rendered assistance to other vessels in distress, and carried out Life-saving Station inspection work.

C.G.S. Constance.—Is a single-screw composite steamer, whose length is 115 feet 6 inches, beam 19 feet 6 inches, draught 11 feet 6 inches, and registered tonnage 125 tons. Her complement is twenty-three officers and men, all told, and she was commanded by Captain J. E. Morris.

This vessel was employed from the beginning of the year until 30th October on examination service and gate duties at Halifax. From the 1st November until the 1st February the vessel was at Halifax.

On 1st February the ship was paid off and the crew transferred to the trawler *Arras,* which replaces the *Constance* in the Fisheries Protection Service.

C.G.S. Petrel.—Is a steel, single-screw ship, length 116 feet, beam 22 feet, draught 9 feet, speed 11 knots, and registered tonnage 191 tons. Her complement is twenty-four officers and men, all told, and she is at present commanded by Mr. G. A. Brunton.

The *Petrel* was in dockyard hands at Halifax on 1st April, 1918, undergoing annual refit, which was completed on the 11th May. During the summer, autumn, and early winter she was employed on examination and other war service. On 1st February she left Halifax to break ice in harbours west of Halifax, as required, but this service was not required very much. She then returned to Fisheries Protection duties on the

western division of the Nova Scotia coast, and continued until the end of the fiscal year. The commanding officer's report states that all branches of fishing were dull during the month of March, owing to the continuous stormy weather prevailing on that part of the coast.

C.G.S. Gulnare.—Is a steel, single-screw vessel, whose length is 137 feet, beam 20 feet 5 inches, draught 12 feet, registered tonnage 262 tons. Her complement is twenty-five officers and men, all told, and she is at present in charge of Mr. John Smith.

This vessel has been turned over to the officers of the Naval Control staff for the last few years, and is now in need of a thorough refit before returning to the Fisheries Protection Service.

C.G.S. Vigilant.—Is a twin-screw steel ship, whose length is 177 feet, beam 22 feet, draught 9 feet 6 inches, registered tonnage 242 tons, and speed 16 knots. She is electrically lighted throughout, and fitted with a powerful searchlight. Her complement is thirty officers and men, all told, and she is commanded by Mr. C. O. McDonald.

Throughout the summer and fall of 1918, the vessel performed regular Fisheries Protection duties in the Great Lakes. During the spring and summer very little poaching by United States boats was found. During August and September, 132 illegally operated nets were seized.

The vessel was laid up for the winter at Port Dover on 21st December, 1918.

C.G.S. Malaspina.—Is a steel, single-screw vessel, whose length is 160 feet, beam 26½ feet, draught 12½ feet, speed 14½ knots, and a displacement of 700 tons. She is electrically lighted throughout, and fitted with a powerful searchlight. Her complement is thirty-three officers and men, all told, and she was built by the Dublin Dockyard Company, Dublin, Ireland, in 1913. She is commanded by Captain Holmes Newcombe.

The vessel was utilized for naval purposes when required, and when not so engaged performed Fisheries Protection patrol work. In addition to these duties the vessel was used for training purposes, and also to inspect the life-saving stations on the west coast. The ship was one of the search squadron which were employed in an endeavour to find traces of the *Galiano,* which was lost with all on board.

C.G.S. Galiano.—Was a steel, single-screw vessel, length 160 feet, beam 26½ feet, draught 12½ feet, speed 14½ knots, and displacement 700 tons. She was electrically lighted throughout, and fitted with a powerful searchlight. Her complement was thirty-three officers and men, all told, and she was built at Dublin, Ireland, by the Dublin Dockyard Company, in 1913. She was commanded by Lieut. R. M. Pope, R.N.R.

This vessel was employed most of the time between the 1st April and 30th October, when she was lost, on Fisheries Protection duties, except for one month from the 21st June, when the ship struck a rock in the west entrance to Browning passage, and was laid up for repairs.

C.G.S. Restless.—Length 71 feet, beam 17 feet, draught 7 feet, commanded by Captain Charles Moore.

Throughout the war this vessel was employed exclusively for naval work, and since no longer required for that branch has been handed over to the college for training purposes. She will be replaced in the Fisheries Protection Service by a trawler built by Canadian Vickers Company in 1917-18.

The west coast service will be made more effective by the addition of the *Stadacona*, a patrol vessel used on the east coast during the war, and two trawlers, which have left Halifax on their way to the west coast through the Panama canal.

7. LIFE SAVING SERVICE.

The department has commenced, during the past year, its programme of gradually abolishing stations which have outgrown their usefulness, with the result that eight stations have been done away with, as follows: Richibucto, N.B.; Pictou Island, N.S.; Port Mouton, N.S.; Whitehead, N.S.; Ucluelet, B.C.; Collingwood, Ont.; Port Hope, Ont.; and Consecon, Ont. This leaves a total of twenty-nine life-saving stations still in existence.

Nova Scotia.—Bay View. Permanent crew. Twenty-three disabled fishing boats were towed in by this life-boat during the year. On the 19th May assistance was rendered to the *Susie N*, dismasted at the entrance of Digby gut, and on the 26th June to the *Harry L.* On November 11 the life-boat assisted in getting the new tern schooner *General Hogg* off the rocks and into port.

Canso. Volunteer crew. Assistance was rendered by this life-boat to the following vessels: February 18, 1918, steamer *Nevada,* stranded at Starling rock; June 11, 1918, s.s. *Lake Haughton,* which ran ashore; November 20, Government drifter *No. 11,* ashore at Starling rock.

Cheticamp. Permanent crew. The usual assistance was rendered to local fishing boats.

Duncan's Cove. Volunteer crew. The troopship *City of Vienna* was wrecked on Sambro ledge, and the life-boat rendered valuable assistance in rescue work.

Herring Cove. Volunteer crew. This boat also assisted greatly in the rescue of men from the troopship *City of Vienna,* bringing 125 men ashore in the life-boat.

Seal Island. Subsidized volunteer crew. The s.s. *Alcor* was sunk on June 12, 1918, 3 miles north of Seal island. Of the 39 persons on board, the life-boat brought ashore 19, the remainder landing in their own boats. The schooner *Ohio* went ashore on the northeast part of the island on 13th July, and the life-boat stood by until she was taken off by a tug.

Westport. Subsidized volunteer crew. On 14th of December the s.s. *Corinthian* was sunk off Batson's ledge. The life-boat assisted by other boats from the vicinity succeeded in taking off the 87 persons on board. On January 16, 1919, the barge *785,* of the Lehigh Valley Railway Company was towed into Meteghan by the life-boat, after being adrift for six days.

New Brunswick.—Little Wood Island. Permanent crew. The Norwegian barque *Ashmore* struck the Muir ledges in a thick fog on April 2, 1918. The crew was taken to the life-boat station and cared for for two days. The 4-masted schooner *Dornfontein* was set afire by German submarine, the crew being set adrift in their boat. They were picked up the next morning, August 1, and cared for by the life-boat crew. Various fishing boats were also assisted by this crew.

Ontario.—Goderich. Volunteer crew. On June 30, 1918, a canoe, with two men in it, capsized. The life-boat succeeded in rescuing one of them.

Long Point. Permanent crew. November 4, the U.S. launch *Verdia* went ashore four miles west of the end of Long point. The life-boat assisted the training ship *Hawk* in releasing her.

Point Pelee. Permanent crew. On May 27, two steam barges, *J. Gould* and *Consort,* grounded about four miles north of the southeast shoal.

Toronto. Permanent crew. Assistance rendered to fifty-five small craft during the season of navigation, 1918.

British Columbia.—The stations at Bamfield and Clayoquot, B.C., were not called upon during the past year for any service in the way of assistance to vessels in distress.

LIFE-SAVING STATIONS OF CANADA

Stations.	Established.	Coxswain.	Crew.	Description of Boat.
New Brunswick—				
1. Little Wood Is. (P)	1910	Harry Harvey	8	36-ft. self-righting power boat.
2. Point Escuminac	1908	E. F. Fleiger	7	Beebe-McLellan self-bailing.
3. Cape Tormentine	1912	I. Allen	7	Beebe-McLellan self-bailing.
Nova Scotia—				
4. Baker's Cove	1886	R. L. Baker	7	Dobbins' Pattern self-righting, 28 feet.
5. Blanche	1889	J. C. Swaine	7	Beebe-McLellan surf-boat, self-bailing, 25 feet long.
6. Clark's Harbour	1900	Byron Swim	7	Beebe-McLellan surf-boat, self-bailing, 25 feet long.
7. Canso		J. J. Berrigan	7	Dobbin's pattern surf-boat, self-bailing, 25 feet.
8. Devil's Island	1885	B. H. Henneberry	7	Beebe-McLellan surf-boat, self-bailing, 25 feet.
9. Duncan's Cove	1886	J. W. Holland	7	Beebe-McLellan surf-boat, self-bailing, 25 feet.
10. Herring Cove	1885	E. V. Dempsey	7	Dobbins' pattern self-righting and bailing, 25 feet.
11. Scattarie	1885	Jas. Nearing	7	Beebe-McLellan surf-boat, self-bailing, 25 feet long.
12. Seal Island (P)	1880	S. G. Penny	7	Beebe-McLellan surf-boat, self-bailing, 25 feet long.
13. Cheticamp (P.N.)	1911	L. J. Au Coin	7	Beebe-McLellan twin-screw motor boat.
14. Bay View (Digby) (P.)	1911	O. Condon	7	36-ft. self-bailing, self-righting power boat.
15. Westport, Briar Is.		R. Welch		Subsidized motor boat.
Prince Edward Island—				
16. Priest Pond		C. Campbell	12	Board of Trade Rocket Apparatus.
17. Charlottetown	1907	E. White	6	Beebe-McLellan self-bailing.
18. Souris	1907	P. Cheverie	7	" "
19. Cascumpeque		J. Hutt	8	" "
20. Alberton	1907	S. Gallant	12	Board of Trade Rocket Apparatus.

NOTE.—Stations marked "P" have permanent crews, always on duty; those marked "P.N." have crews always on duty during the season of navigation. The other stations have volunteer crews, which drill twice a month and are called out on the occurrence of a wreck.

LIFE-SAVING STATIONS OF CANADA.—*Concluded.*

Stations.	Established.	Coxswain.	Crew.	Description of Boat.
British Columbia—				
21. Bamfield (P.)	1909	F. Thompson	11	36-ft. power boat.
22. Clayoquot (P.)	1908	J. McLeod	8	" "
Ontario—				
23. Cobourg	1882	M. McMahon	8	Dobbins' pattern self-righting and bailing.
24. Goderich	1886	M. McDonald	7	Surf boat.
25. Long Point (P.N.)	1902	J. Smith	9	"
26. Point Pelee (P.N.)	1900	L. Wilkinson	7	"
27. Port Stanley	1885	W. Brown	7	Beebe-McLellan surf-boat, self bailing 25 feet.
28. Toronto	1883	W. F. Chapman	14	Two motor launches.
29. Southampton	1907	H. McLeod	7	Beebe-McLellan surf-boat, self-bailing.

8. RADIOTELEGRAPH SERVICE.

The total number of radiotelegraph stations in operation in the Dominion and on ships registered therein is as follows:—

Government commercial stations	1
Coast stations	47
Government ship stations	50
Licensed ship stations	107
Public commercial stations	2
Private commercial stations	5
Radiotelegraph training school	13
Licensed experimental stations	4
Total	229

All amateur stations were closed down at the beginning of the war, and licenses for their reopening have not yet been issued.

Operation of the Coast Station Service.—The total number of messages and words handled during the year was as follows:—

	Messages.	Words.
East coast	70,179	1,565,698
Great lakes	19,130	402,937
West lakes	187,668	3,625,100
Hudson bay	3,004	212,036
	279,981	5,805,771

The business handled by the East Coast system shows an increase over last year amounting to 33,408 messages containing 745,468 words.

The Great Lakes system (operated by the Marconi Wireless Telegraph Company of Canada, Ltd., under contract) shows an increase of 2,321 messages containing 95,208 words.

The West Coast system (operated by the department), shows an increase of 39,783 messages containing 1,316,839 words.

The Hudson Bay system (operated by the Department for the Department of Railways and Canals) shows a decrease of 2,930 messages containing 218,044 words. The Le Pas and Port Nelson stations were closed down on the 15th October, 1918.

Revenue.—The total revenue collected during the year amounted to $44,228.77 as against $22,418.28 in 1917-18. The West Coast service shows an increase of $21,300.91; the Great Lakes a decrease of $32.54, and the East Coast an increase of $602.12.

Examination for Certificate of Proficiency.—One hundred and fifty-eight operators were examined during the year, including 11 re-examinations; 103 candidates were successful and 55 failed. Two holders of certificates passed successful examinations in the operation of other equipments and have had their original certificates amended accordingly.

Assistance Rendered Ships.—Assistance was rendered by the Government Radiotelegraph Service during the year to the following vessels in distress: SS. *Burma Maru,* ss. *Aikoku Maru,* ss. *Canada Maru,* ss. *Princess Adelaide,* ss. *Alaska,* ss. *Princess Sophia,* C.G.S. *Galiano,* U.S. *Submarine H. 7, Admiral Watson,* ss. *Latouche,* ss. *City of Wilmington,* ss. *Crystal Lake,* ss. *Ascania,* ss. *Lake Houghton,* ss. *Sewalls Point,* ss. *City of Vienna,* ss. *Imperoyal,* ss. *Winnifredian.*

NEW CONSTRUCTIONS, ADDITIONS AND ALTERATIONS, WEST COAST.

Gonzales Hill.—The engine-room has been enlarged and the transmitting apparatus removed from the high-tension room and reinstalled therein. The mast rigging was overhauled, and the masts generally placed in good condition.

Alert Bay.—The apparatus was rearranged and overhauled. The earth system was improved and a new aerial erected.

Point Bay.—A charging set has been installed and direct communication with Alert Bay station established.

Ikeda Head.—The rigging and apparatus were overhauled. One 2 k.w. set of apparatus, complete with engine, was dismounted and sent to Dead-Tree Point.

Dead-Tree Point.—The appartus was overhauled and put in good working order. The 2 k.w. set from Ikeda Head has been stored on the station.

Digby Island.—The apparatus was overhauled and put in good working order.

Estevan Island.—The rigging was overhauled and stays set up. A new aerial was erected and the buildings repainted.

East Coast (Barrington Passage).—The installation of a 25-k.w. arc set was completed and placed in commission on August 17, 1918.

Camperdown.—The old 4-horsepower verticle type, Fairbanks-Morse was replaced by a 6-horsepower type Z engine of the same make, also a separate battery charging outfit consisting of a 1½-horsepower Fairbanks-Morse type Z engine and a 3-k.w. D.C. generator was installed for charging the storage battery, which was increased to 55 cells by the addition of 40 new cells manufactured by the Canadian Hart Accumulator Company. Necessary alterations were made to the station building to accommodate the new equipment. The building was repaired and painted, and the mast and rigging overhauled.

General.—Certain of the East Coast stations which were taken over and operated by the department for naval purposes during the war were handed back to the operating company on the following dates:—

North Sydney—December 15, 1918.
Camperdown—January 8, 1919.
Sable Island—January 14, 1919.
Cape Sable—April 1, 1919.

The Point Riche station was closed down on the 16th November, 1918, at the end of the season of navigation, and was automatically returned to the operating company on that date.

The department has continued its policy of maintaining the apparatus on the different stations up-to-date, and the service continues to maintain a degree of efficiency which compares favourably with that obtained elsewhere.

The administration of the Radiotelegraph Act, with which this department is charged, has been carried on as usual, and no evasions or attempted evasions of that section of the Act calling for the compulsory equipment of radiotelegraph apparatus on certain steamers have been reported.

An inspection service is maintained by the department, and vessels are regularly inspected to see that the law is being complied with.

DIRECTION-FINDING STATIONS.

During the period of hostilities four direction-finding stations were erected on the east coast at the following points:—

Chebucto Head, N.S.
Cape Sable, N.S.
Canso, N.S.
Cape Race, Nfld.

Direction-finding stations are stations fitted with apparatus which enables the direction of an incoming wireless signal to be determined, thus giving the bearing of the transmitting ship or station. Such information is of the greatest assistance to vessels in fog or making the land, in that it enables them to check their calculated position with reasonable accuracy.

Experience tends to indicate that the bearings obtained may be relied upon up to within two degrees. A vessel must, of course, be so situated as to obtain cross bearings from two direction-finding stations before it can lay off its true position.

The results obtained from the above stations were very encouraging, and at the close of hostilities it was decided to continue their operation as an aid to navigation for the benefit of the mercantile marine. The service for the present is being given free of charge to shipowners; it is proposed to continue this free service unless the privilege is abused. The masters of vessels plying to east coast ports are evidently finding the direction-finding stations of great assistance to them, and are petitioning for the service to be extended to other points.

School for Training of Operators.—The training school, which was transferred from Halifax and reopened in Ottawa on the 8th January, 1918, was closed down on the 17th February, 1919.

During the time this school was in operation 159 students were trained, of whom 140 qualified as fourth-class operators, 6 were discharged for inability, 4 for medical reasons, and 9 were demobilized before completing their course.

PERSONNEL.

The personnel of the Radiotelegraph Service in the Dominion is as follows:—

	Government.				Commercial.			
	Headquarters.	Coast Stations.	Land Stations.	Ship Stations.	Headquarters.	Coast Stations.	Land Stations.	Ship Stations.
Engineers and officers in charge	2	21	1	61	5	33	10	114
Operators	7	50		57		40	16	20
Other employees	5	16			112		15	
Executive officials and inspectors	2	2			18			
	16	89	1	118	135	73	41	134

Total personnel 607

9. FINANCIAL STATEMENT.

The attached financial statement shows the expenditure under the various appropriations, and a revenue of $291,061.29 received by the department during the fiscal year ended March 31, 1919.

The gross expenditure for the year is $30,203,363.61; the amount of refunds and transfers to next year is $16,818,022.86, leaving a net expenditure of $13,385,345.75 for fiscal year 1918-19.

The expenditure on account of H.M.C.S. *Niobe, Rainbow,* the submarines and other vessels engaged in the defence of our coasts, the Royal Naval Hospital (Halifax), the dockyards at Halifax and Esquimalt have been charged to War appropriation, and the Royal Naval College to Naval Service appropriation.

A statement of stores supplied, work done, and advances made on behalf of the British, French, and American Governments, and others, is also given. These disbursements amount during the fiscal year 1918-19 to $11,609,209.15, and to this should be added the sum of $1,649,033.93, transferred from fiscal year 1917-18, thus making a grand total of $13,258,243.08 debited against the Allies, etc., during fiscal year 1918-19. Credits and cash received during the year amount to $8,156,693.23, leaving an outstanding balance of $5,101,549.87 which is not included in the amounts charged to War or Naval appropriations, but carried in suspense to the fiscal year 1919-20.

STATEMENT showing accounts outstanding in respect to stores supplied, work done and advances made, etc., at the end of fiscal year 1918-19.

SUSPENSE ACCOUNTS.

——	Debit.	Credit.	Balance transferred to 1919–20.
British Admiralty	$6,139,571 86	$3,861,838 77	$2,277,733 09
British Ministry of Shipping	23,703 36	2,000 78	21,702 58
French Admiralty	13,363 70	8,266 79	5,096 91
Department of Marine	26,383 49	16,082 32	10,301 17
Department of Militia and Defence	29,087 64	22,167 70	6,919 94
United States Government	192,011 49	10,308 65	181,702 84
Imperial Government	6,284,043 31	4,018,181 84	2,265,861 49
Miscellaneous	307,734 96	217,846 38	89,888 58
Allotments (balance)	12,674 08	.....	12,674 08
Sundry Advances (balance)	229,669 19	.....	229,669 19
Totals	$13,258,243 08	$8,156,693 23	$5,101,549 87

STATEMENT of jobs completed in the workshops and stores supplied by the Halifax and Esquimalt dockyards during fiscal year 1918-19.

——	Halifax.	Esquimalt.
Naval Service	$1,911,953 72	$198,125 37
Fisheries Protection Service	18,882 95	5,394 95
Hydrographic Survey	566 69	7,807 98
Life Saving Service	2,792 36	1,630 50
Radiotelegraph Service	7,390 72	3,438 17
Fishery Patrol Service	3,674 88	4,779 78
British Admiralty	1,484,022 53	469,935 71
British Ministry of Shipping	.....	22,385 77
United States Government	34,872 85	.....
Department of Marine	.....	1,299 34
Sundries	2,361 79	4,502 20
	(*a*) $3,466,518 49	$719,299 77
Wages paid (*b*)	$ 500,642 89	$ 309,263 78
Salaries	84,925 53	48,506 89
Stores issued (*c*)	2,559,238 09	319,372 70

(*b*) and (*c*) included in (*a*).

STATEMENT of appropriation accounts for fiscal year 1918-19.

Service.			Appropriation.	Expenditure.	Balance Unexpended.
			$ cts.	$ cts.	$ cts.
Naval Service			600,000 00	228,728 08	371,271 92
Fisheries Protection Service			300,000 00	76,671 66	223,328 34
Hydrographic Survey			215,000 00	87,608 62	127,391 38
Radiotelegraph Service			225,000 00	221,488 91	3,511 09
Tidal Service			25,000 00	18,223 02	6,776 98
Patrol of the Northern Waters of Canada			65,000 00	65,000 00	
Rewards for saving life, including Life-saving Service			100,000 00	89,843 61	10,156 39
Royal Naval College			25,000 00	.....	25,000 00
			1,555,000 00	787,563 90	767,436 10
Fisheries—					
Salaries and Disbursements of Fishery Officers, Fishery Patrol Service, and Oyster Culture			500,000 00	466,867 88	33,132 12
Fish-breeding Establishments			300,000 00	241,211 61	58,788 39
Cold Storage and Transportation of Fish			110,000 00	107,957 85	2,042 15
Building Fishways and Clearing Rivers			10,000 00	5,728 16	4,271 84
Legal and Incidental Expenses			4,000 00	1,357 08	2,642 92
Fisheries Intelligence Bureau			5,000 00	2,090 44	2,909 56
Toronto Exhibition			5,000 00	4,295 25	704 75
Inspection of Canned and Pickled Fish			15,000 00	11,966 39	3,033 61
Marine Biological Board			26,000 00	26,000 00	
			975,000 00	867,474 66	107,525 34
Civil Government			209,150 00	168,236 39	40,913 61
Contingencies			50,000 00	.....	
			259,150 00	.....	
Fishing Bounty			160,000 00	159,675 25	324 75
Recapitulation.					
Naval Service			1,555,000 00	787,563 90	767,436 10
Fisheries			975,000 00	867,474 66	107,525 34
Civil Government			209,150 00	168,236 39	40,913 61
Contingencies			50,000 00	37,295 54	12,704 46
Fishing Bounty			160,000 00	159,675 25	324 75
			2,949,150 00	2,020,245 74	928,904 26
War appropriation—					
Disbursements	$20,837,963 86				
Carried from 1917-18	995,015 09				
Gross expenditure	$21,832,978 95				
Less—					
Reimbursements and credits	$7,787,332 57				
Transferred to 1919-20	2,746,646 92				
		$10,533,979 49			
Net expenditure				11,298,999 46	
Imperial Government special account—					
Disbursements	$ 5,630,024 47				
Carried from 1917-18	654,018 84				
		$ 6,284,043 31			
Less—					
Reimbursements	$ 4,018,181 82				
Transferred to 1919-20	2,265,861 49				
		$ 6,284,043 31			
Miscellaneous, Vote 419					60,753 18
Miscellaneous Gratuities					729 14
Consolidated Revenue Fund unappropriated, chap. 140, sec. 79, R.S. 1906					4,618 29
Total net expenditure fiscal year 1918-19					13,385,345 81

SESSIONAL PAPER No. 39

STATEMENT of expenditure under the Naval appropriation for the fiscal year ended March 31, 1919.

——	Royal Naval College.	Head-quarters.	General Account.	Total.
	$ cts.	$ cts.	$ cts.	$ cts.
Pay and Allowances	59,689 00	18,542 78	129 60	78,361 38
Stores and Allowances	44,223 38	2,546 38	889 34	47,659 10
Medical services	645 22	. . . . .	. . . . .	645 22
Cadets, miscellaneous expenses	184 31	. . . . .	. . . . .	184 31
Repairs and maintenance	53,352 74	. . . . .	. . . . .	53,352 74
Miscellaneous effective services	44,201 47	3,284 76	256 06	47,742 29
Non-effective pay	583 04	. . . . .	200 00	783 04
	202,879 16	24,373 92	1,475 00	228,728 08

STATEMENT of expenditure under the war appropriation

Ship or Establishment.	Pay and allowances.	Stores and allowances.	Medical services.	Martial law.	Boys, training and recruiting.
	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
H.M.C.S. "Niobe"	1,346,656 93	678,874 84	13,806 32	1,256 27	191 36
H.M.C.S. "Rainbow"	176,929 57	62,127 57	7,179 37	186 36	
Halifax Dockyard		1,184,830 41			
Esquimalt Dockyard		323,975 05	87 25		
R.N.C.V.R.. Overseas Division	372,383 66	95,647 35	839 71		6,180 07
R.C.N. Hospital	7,266 85	31,395 43	1,823 59		
R.C.N. Air Service	24,400 50	75,046 51	580 25		897 79
H.M.C.S. "Lansdowne" (Depot)	86,363 36	144,689 68	1,958 59	14 10	
H.M.C.S. "Seagull" (Depot)	626,167 51	677,060 42	4,432 60	295 82	
H.M.C.S. "Guelph" (Depot)	362,041 87	439,713 27	321 11	33 80	
Hopper Barges Nos. 1 and 2	9,434 14	17,660 84	6 00		
6 Steel Trawlers (Vickers)					
6 Steel Trawlers (Polsons)					
Submarine Depot	112,233 25	104,121 41	365 15		448 49
R.N. College					
Barrington W. T. Station			236 60		
Atlantic Defences	76,457 54	246,236 41	603 25		
Pacific Defences	36,888 49	36,754 77	1,144 43		
Headquarters	166,592 33	18,466 33	2,917 96		40 00
General Account	33 00	152,498 79	20 00		14,783 42
	3,403,849 00	4,289,099 08	36,322 18	1,786 35	22,541 13

Less credits:—		
Halifax Dockyard, arisings	$	4,530 58
Esquimalt Dockyard, arisings		845 86
Halifax Dockyard, water delivered to sundry vessels		6,229 33
Hopper Barge No. 1 " " "		9,753 61
Hopper Barge No. 2 " " "		5,980 83
Vessels sold		272,400 00
		$11,298,999 46

during fiscal year ended March 31, 1919.

Repairs and maintenance.	New ships.	Works, lands, buildings.	Miscellaneous effective services.	Non-effective pay.	Hire of vessels.	Total.
$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.	$ cts.
81,619 11	.....	.....	190,503 35	3,206 51	.....	2,316,114 69
561 71	.....	.....	18,961 80	2,506 00	.....	268,452 38
498,842 84	.....	249,563 84	7,981 67	.....	.....	1,941,218 76
60,514 98	.....	.....	1,677 39	.....	.....	386,254 67
.....	.....	.....	334 69	84,169 53	.....	559,555 01
36,433 98	.....	15,126 76	5,043 46	787 50	.....	97,877 57
6,741 00	.....	28,607 64	28,527 92	.....	5,334 55	170,136 16
19,616 16	.....	11,788 69	42,772 03	72 00	.....	307,274 61
446,824 02	.....	.....	61,575 75	183 60	2,498 07	1,819,037 79
161,259 20	.....	.....	16,500 99	14 73	5,266 55	985,151 52
17,833 20	.....	.....	794 01	.....	.....	45,728 19
.....	55,804 40	.....	.....	.....	.....	55,804 40
.....	2,302 44	.....	.....	.....	.....	2,302 44
74,633 39	.....	.....	8,513 42	188 89	.....	300,504 00
.....	.....	.....	.....	82 50	.....	82 50
.....	.....	8,937 56	.....	.....	.....	9,174 16
87,983 90	.....	51,978 63	95,767 23	.....	35,140 28	594,167 24
36,217 60	.....	.....	13,929 61	.....	.....	124,934 90
.....	.....	.....	80,491 38	.....	.....	268,508 00
.....	.....	.....	137,200 42	1,041,925 05	.....	1,346,460 68
1,529,081 09	58,106 84	366,003 12	710,575 12	1,133,136 31	48,239 45	11,598,739 67

STATEMENT of revenue of the Department of the Naval Service for fiscal year ended March 31, 1919.

	$ cts.	$ cts.
Royal Naval College—College fees		3,650 00
Fisheries revenue		123,114 29
Casual revenue		109,693 77
Miscellaneous revenue		2,096 94
Wireless apparatus licenses		293 00
Wireless Operator's examination fees		156 00
Fish culture revenue		8,592 64
Premiums, discount and exchange		442 41
Radiotelegraph revenue—		
Alert Bay	1,593 60	
Cape Lazo	551 83	
Deadtree Point	5,202 89	
Digby Island	7,619 22	
Estevan Point	1,999 70	
Gonzales Hill	5,977 88	
Ikeda Head	319 56	
Pachena Point	148 59	
Point Grey	9,532 97	
Triangle Island	9,687 85	
Galiano	11 28	
Camperdown	263 23	
Sable Island	67 26	
North Sydney	46 88	
Barrington Passage	31 56	
Heath Point	20 50	
		43,074 80
Total		291,113 85

FISHERIES revenue for fiscal year ended March 31, 1919.

Provinces.	Amount Collected.	Refunds.	Net Amount.
	$ cts.	$ cts.	$ cts.
Ontario	631 85		631 85
Quebec	8,125 80	14 00	8,111 80
New Brunswick	16,420 52		16,420 52
Nova Scotia	7,629 31	16 50	7,612 81
Prince Edward Island	2,561 19		2,561 19
Manitoba	12,780 20	50 00	12,730 20
Saskatchewan	4,982 83		4,982 83
Alberta	10,293 15	5 00	10,288 15
British Columbia	59,349 94		59,349 94
Yukon	425 00		425 00
	123,199 79	85 50	123,114 29

GENERAL.

I have to express the appreciation of the Department for the efficient manner in which the staffs of the different branches have performed their duties during the past year.

I have the honour to be, sir,
Your obedient servant,

G. J. DESBARATS,
Deputy Minister.